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HANDBOOK
OF
OPERATING INSTRUCTIONS

SPECTRUM ANALYZER

MODEL TSA-W

SERIAL NOS. 107 - 101 - 106 - 107

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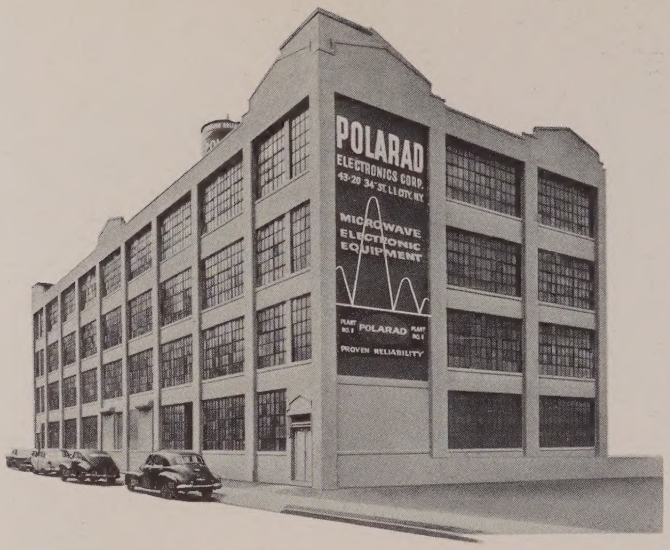

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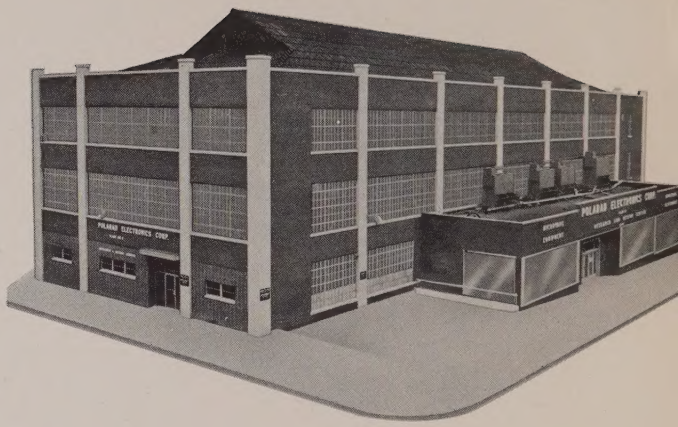

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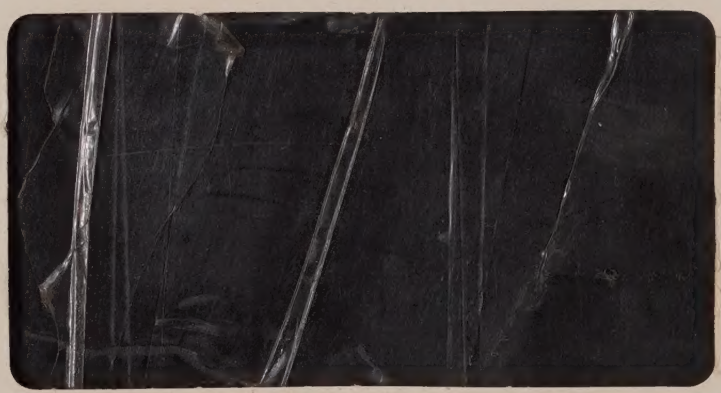

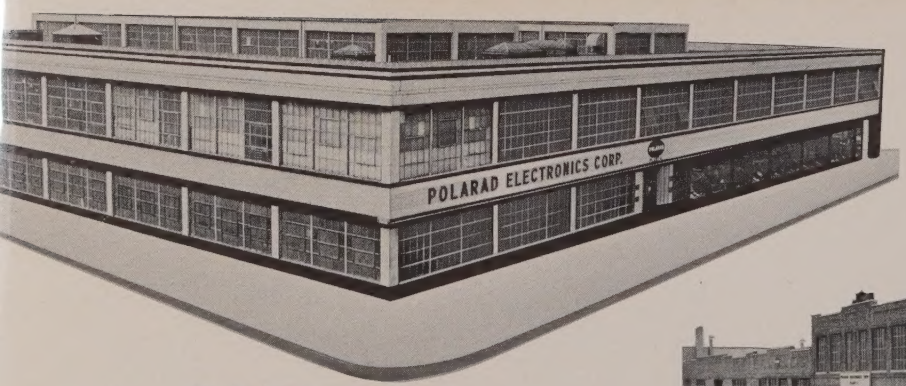

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POLARAD

PROVEN RELIABILITY

INSTRUCTION MANUAL

SPECTRUM ANALYZER

MODEL TSA-W

SERIAL NOS. 107, 124, 126, 127, 128, 129, 131, 134, 136, 146, 148, 404, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 463, 465, 466, 467, 468, and 500 thru 554.

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SECTION I
INTRODUCTION

1-1. SCOPE OF MANUAL.

This instruction manual contains directions for the installation, operation, and maintenance of the direct-reading table-top Spectrum Analyzer, Model TSA-W, covering the frequency range from 10 mc to 44,000 mc. In addition to these instructions, there is a listing of the technical characteristics as well as a brief theory of operation of the equipment. The unit is designed and manufactured by Polarad Electronics Corporation, Long Island City 1, New York.

1-2. USES OF THE MODEL TSA-W SPECTRUM ANALYZER.

a. The TSA-W Spectrum Analyzer permits rapid and accurate measurement, and spectral display of the frequency distribution of energy in an rf signal in the 10 mc to 44,000 mc range. Cw and pulsed radio signals are presented visually as a plot of voltage vs. frequency.

b. Specific uses of the equipment are:

(1) Observing and measuring side bands associated with amplitude and frequency modulated signals.

(2) Determining the presence and measuring the frequency of radio and/or radar signals.

(3) Determining the type of modulation in radio and/or radar signals.

(4) Checking and observing the tracking of rf components of a radar system, for example, tracking transmitter and receiver.

(5) Determining rf pulse characteristics.

(a) Frequency modulation
(b) Pulse width
(c) Pulse shape

} By Spectrum Analysis.

(6) Checking the spectrum of pulsed magnetron oscillators, to determine pulse characteristics and to check frequency pulling.

(7) Measuring noise spectra.

(8) Checking the frequency difference and/or spectrum of two rf signals.

(9) Checking frequency relationships of multi-frequency transmitters, for example DME transmitters.

(10) Checking for parasitic oscillations.

(11) Testing for interference sources throughout frequency range from any electrical equipment.

(12) Checking transmitter or signal generator for continuous output throughout its tuning range (checking for "holes").

(13) Frequency drift of oscillators.

(14) Locating sources of rf leakage.

(15) Indicator for frequency standards.

SECTION II
DESCRIPTION

2-1. GENERAL.

The Polarad Model TSA-W Spectrum Analyzer is a laboratory instrument consisting of a complex superheterodyne receiver working into a cathode-ray display. Signals in the frequency range from 10 mc to 44,000 mc may be analyzed. It comprises the main chassis, Model DU-2A, and one of the five replaceable R-F Tuning Units, STU-1WA, -2WA, -3WA, -4WA, or -5WA. Tuning Unit STU-1WA covers the range from 10 mc to 1,000 mc; Tuning Unit STU-2WA from 910 mc to 4,560 mc; Tuning Unit STU-3WA from 4,370 mc to 22,000 mc; Tuning Unit STU-4WA from 21,000 mc to 33,000 mc; and Tuning Unit STU-5WA from 33,000 mc to 44,000 mc. The R-F Tuning Unit receives rf signals and converts them to an intermediate frequency of 160 mc, which is amplified, further heterodyned, and detected by the various circuits within the Model DU-2A. Signals detected are presented on a cathode-ray tube screen as a plot of voltage versus frequency, with voltage on the vertical axis and frequency on the horizontal axis. Controls are provided on the front panel for continuously adjusting the spectrum width, observed on the screen, from a band of frequencies as narrow as 200 kc to a band as wide as 80 mc, as desired. The Model DU-2A consists of six subchassis secured together on a single frame. In operation, a tuning unit is inserted into the frame. All required voltages are provided by four electronically regulated power supplies and one unregulated supply incorporated into the main chassis. The unit is portable and designed for either bench, wagon, or rack mounting.

2-2. TECHNICAL CHARACTERISTICS.

Frequency Range:

With R-F Tuning Unit STU-1WA	10 mc to 1,000 mc.
With R-F Tuning Unit STU-2WA	910 mc to 4,560 mc.
With R-F Tuning Unit STU-3WA	4,370 mc to 22,000 mc.
With R-F Tuning Unit	

STU-4WA . . . . . 21,000 mc to 33,000 mc.
With R-F Tuning Unit
STU-5WA . . . . . 33,000 mc to 44,000 mc.
Spectrum Display . . . Signal amplitude on the vertical axis versus frequency on the horizontal axis.
Variable Bandwidth (3 db). . . . . 7 kc at low and 50 kc at high dispersion setting.
Frequency Dispersion . . . . . 200 kc to 70 mc in two bands, 200 kc to 10 mc and 3 mc to 70 mc. (Usable range up to 80 mc.)*
Sweep Repetition Rate. . . . . 1 cps to 30 cps, adjustable.
Sweeper Center Frequency . . . . . 224 mc.
Synchronization . . . . Either line frequency internal, negative external pulse, or free running.
Intermediate Frequencies:
1st i-f . . . . . Preamplifier and wide band amplifier centered at 160 mc with a bandwidth of 70 mc (3 db).
2nd i-f . . . . . 64 mc.
3rd i-f . . . . . 6 mc.
4th i-f . . . . . 500 kc.
Frequency Marker . . 160 ±40 mc.
R-F Tuning Dial Accuracy
STU-1WA . . . . . ±1% of L.O. frequency.
STU-2WA, -3WA, -4WA, and 5WA. . . . . ±1% of dial reading.
Sensitivity (minimum discernible signal):
R-F Tuning Unit
STU-1WA. . . . . Low range: -85 dbm.
High range: -80 dbm.
R-F Tuning Unit
STU-2WA. . . . . Low range: -85 dbm.
High range: -75 dbm.
R-F Tuning Unit
STU-3WA. . . . . Low range: -77 dbm.
High range: -65 dbm.
R-F Tuning Unit
STU-4WA. . . . . -57 dbm.
R-F Tuning Unit
STU-5WA. . . . . -50 dbm.
Attenuation:
R-F (STU-1WA, STU-2WA, STU-3WA only). . . . 0 to 100 db, continuously variable.
I-F . . . . . 0 to 50 db, continuously variable.
Input Impedance . . . . . 50 ohms (nominal)
Max. R-F Power Input (through attenuator) . . 250 milliwatts.
Power Input . . . . . 400 watts at 115 or 230 volts ±10%, 50 to 60 cps.
Tube Complement:
DU-2A . . . . . 2-5R4; 2-807; 2-6AU6; 5-0A2; 2-6AR6; 1-5ADP7; 1-6AS6; 1-12AT7; 2-6AK5; 6-6AG5; 3-12AU7; 1-6BZ7, 4-5718; 2-6AN8; 4-12AX7, 3-6080; 1-5881; 1-5651; 4-1Z2; 2-6BE6; 4-6922.
STU-1WA. . . . . 1-6AF4A; 3-6AM4.
STU-2WA. . . . . 1-ZV1009; 1-6X4; 1-1N21B.
STU-3WA. . . . . 1-5721; 1-6X4; 1-1N26.
STU-4WA. . . . . 1-5721; 1-6X4; 1-1N26.
STU-5WA. . . . . 1-5721; 1-6X4; 1-1N53.
Dimensions: . . . . . 17-3/4 in. wide x 20-3/8 in. high x 24-3/4 in. deep.
Weight . . . . . 135 pounds (including one tuning unit).

* Except in the STU-1WA, where frequency dispersion is 200 kc to 5 mc below 55 mc, and 25 mc maximum from 55 to 1000 mc.

2-3. EQUIPMENT SUPPLIED.

The equipment supplied with the Model TSA-W Spectrum Analyzer is listed in Table I.

TABLE I. EQUIPMENT SUPPLIED

Item	Part or Model No.
Spectrum Analyzer main chassis	Polarad Model DU-2A
R-F Tuning Unit*	Polarad Model STU-1WA STU-2WA, STU-3WA, STU-4WA, and STU-5WA.
Spanner Wrench	J.H. Williams, #482
Type N Adapter	Polarad CSLJ1700**
Waveguide Adapters	Polarad C20947**; BP24550**; BP22330***; BP22331***

* Model TSA-W includes one R-F Tuning Unit.
** Supplied with Model STU-3WA only.
*** Supplied with Model STU-4A only.

SECTION III

OPERATION

3-1. PRELIMINARY INSPECTION.

Before setting up the equipment for operation, inspect the items as listed in Table II.

TABLE II. PRELIMINARY CHECK LIST

CHECK	SYMPTOMS	CORRECTIVE ACTION
Control knobs, switches.	Loose, stiff.	Tighten set screw. Loosen set screw, adjust for easy movement and retighten set screw.
Screws	Loose	Tighten
Cables and Plugs	Cut or broken insulation; broken, cracked, loose pins or fittings.	Tape, tighten or replace.
Meter and Indicator	Broken glass; bent indicator.	Replace movement.
Connectors	Loose, broken or deformed.	Tighten or replace.

3-2. FUNCTION OF CONTROLS AND CONNECTORS.

Table III lists the functions of controls, connectors and indicators designated on the front panel of the unit. See Figure 1.

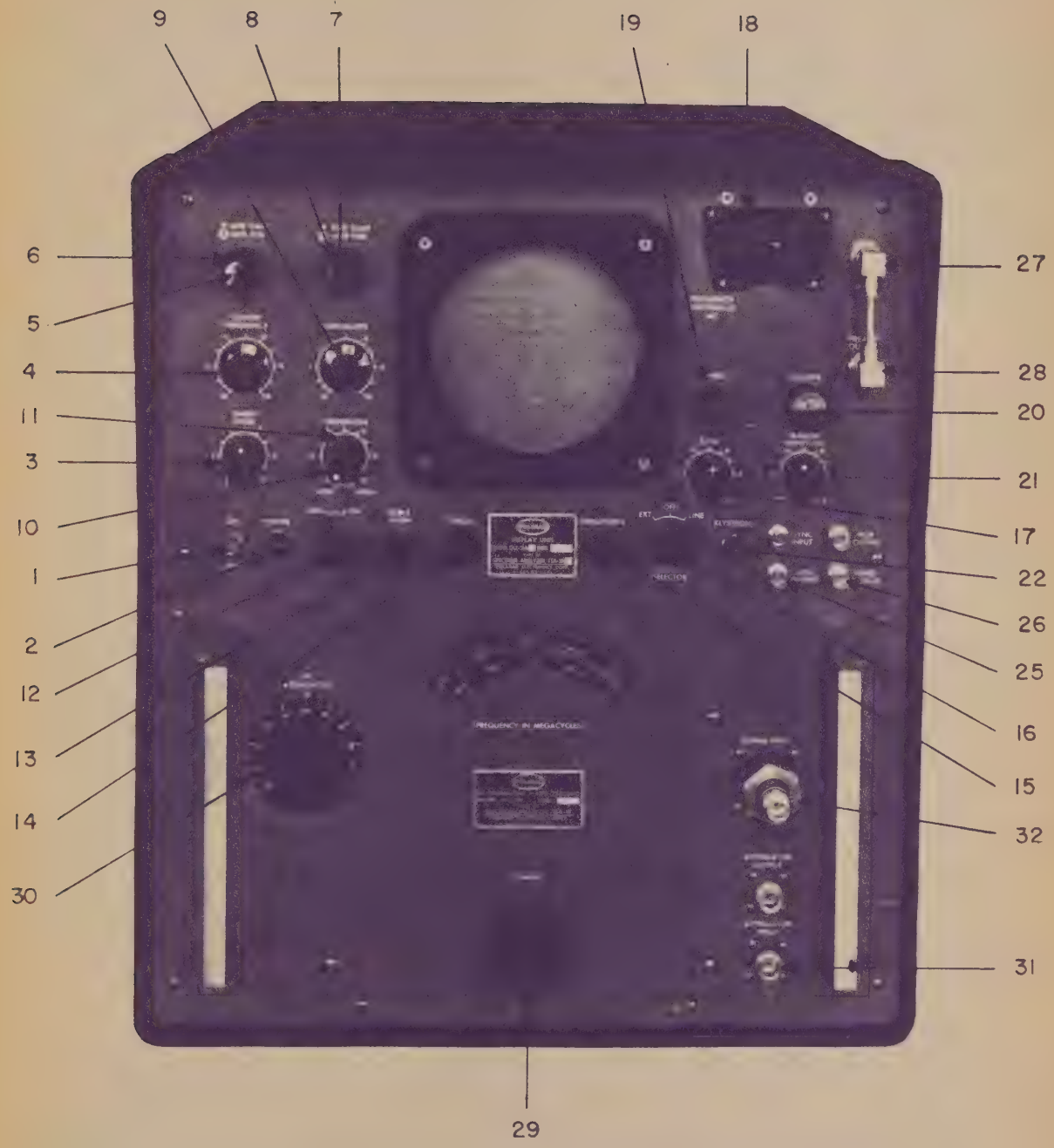

FIGURE 1. CONTROL PANEL OF MODEL TSA-W SPECTRUM ANALYZER

TABLE III. CONTROLS, CONNECTORS AND INDICTORS AND THEIR FUNCTIONS

CONTROL/CONNECTOR/ INDICATOR	REF. NO. SEE FIG. 2	FUNCTION
ON-OFF switch (S75)	1	The switch closes the circuit in the primary of the power transformer which applies a-c power to the equipment.
POWER pilot lamp (DS76)	2	An illuminated pilot lamp indicates that power is being applied to the low voltage circuits, except the klystron power supply.*
SWEEP SPEED (R505A)	3	Provides an adjustable sweep repetition rate from 1 to 30 cps.
CENTER FREQUENCY (R586)	4	Adjusts the center frequency of the sweep frequency generator.
HOR GAIN (R528B))	5	Varies the length of the trace on the CRT (cathode-ray tube) screen.
HOR POS (R528A)	6	Shifts the trace left or right on the CRT screen.
VERT GAIN (R583B)	7	Varies the width of the display on the CRT screen.
VERT POS (R583A)	8	Shifts the trace up or down on the CRT screen.
INTENSIFIER	9	Intensifies peak signal display on the CRT screen.
DISPERSION: LOW-HIGH ( )	10	Selects dispersion range (usable range to 80 mc) LOW - 200 kc to 10,000 kc HIGH - 3 mc to 70 mc
CONTROL (R538)	11	Varies the frequency dispersion within the selected range.

*See KLYSTRON pilot lamp.

TABLE III. CONTROLS, CONNECTORS, INDICATORS AND THEIR FUNCTIONS (Cont'd)

CONTROL/CONNECTOR/ INDICATOR	REF. NO. SEE FIG. 2	FUNCTION
LOG LIN (S501)	12	Permits selection of either logarithmic (LOG) or linear (LIN) display of the CRT trace.
SCALE ILLUM	13	Controls illumination of the CRT graticule.
FOCUS (R79)	14	Controls the sharpness of the CRT trace.
BRIGHTNESS (R78)	15	Controls the intensity of the trace on the CRT screen.
SYNC SELECTOR (S76)	16	Permits the selection of synchronization type: EXT - external, OFF - free running LINE- internal(power line frequency)
SYNC (R76)	17	Varies sync amplitude for locking sweep generator.
FREQUENCY DIFFERENCE-MC dial:	18	Shows the variation in frequency from i-f center frequency.
COARSE (C302)	19	Permits setting the marker pip within ±40 mc of the i-f bandpass.
VERNIER (C303 and C312)	20	Permits setting the marker pip within ±1.0 mc of the i-f bandpass.
MARKER AMPLITUDE (R304)	21	Controls the height of the marker pip on the CRT screen, or removes the pip when set counterclockwise in the OFF position.
KLYSTRON pilot lamp (DS75)	22	Indicates completion of 60 second delay cycle and application of power to the klystron power supply.**
SYNC INPUT (J75)	23	Receives external sync signal which is then applied to the phantastron generator.

**STU-2WA through STU-5WA Only.

TABLE III. CONTROLS, CONNECTORS, INDICATORS AND THEIR FUNCTIONS (Cont'd)

CONTROL/CONNECTOR/ INDICATOR	REF.NO. SEE FIG. 2	FUNCTION
HOR OUTPUT (J76)	24	Makes the sweep available for external use.
LOG OUTPUT (J78)	25	Provides for external use of the logarithmic signal.
VIDEO OUTPUT (J77)	26	Permits remote viewing of the video signal.
I-F INPUT (J701)	27	Provides a convenient terminal point for injecting an external test signal into the wide band amplifier.
PREAMP OUTPUT	28	Provides an access to the output of the r-f tuning unit.
TUNING	29	Selects the operating frequency, as indicated on the dial.
RF ATTENUATOR ***	30	Provides a means of attenuating an input signal connected to ATTENUATOR RF INPUT connector.
ATTENUATOR RF INPUT***	31	R-f input connection for high level signal (greater than -30 dbm) to be applied through the attenuator.
DIRECT RF INPUT	32	R-f input connection for low-level signal, utilizing maximum sensitivity of instrument.

***STU-1WA through STU-3WA only.

3-3. SETTING-UP THE EQUIPMENT.

Model TSA-W Spectrum Analyzer can be operated on either 115 or 230 volts depending on the internal line voltage switch, S104, setting. The unit is factory set for 115 volt operation. If 230-volt operation is required, first, remove the unit from its cabinet by turning the four cam-lock type screws located at the rear of the cabinet one quarter turn counterclockwise and sliding the Display Chassis out. Second, place the internal line voltage switch, which is now accessible from rear of chassis, in the 230 volt position. Slide the Display Chassis back into cabinet and lock by turning the four cam-lock type screws a quarter turn clockwise.

A. Tuning-Unit Hook-Up.

Check whether frequency range of tuning unit (see paragraph 2-2) covers the possible frequency of signal under test. If not, remove tuning unit from Display Chassis by loosening the four screws at the handles on the front panel of tuning unit and sliding the unit out. Disconnect plugs P1502 and P104, which terminate the two cables from the main chassis. Choose proper unit; connect plugs P1502 and P104; slide unit into Display Chassis, and tighten the four screws.

B. Turning-on and Pre-Test Adjustments of the Equipment.

(1) Connect power cord to a 115 or a 230 VAC 50/60 power source, depending on the internal line voltage switch setting as described above.

(2) Place the ON-OFF switch, 1, in the ON position. The POWER pilot lamp, 2, should light immediately, and the KLYSTRON* pilot lamp, 22, should light after a delay of 60 seconds. Allow a minimum of ten minutes, for warm-up, before proceeding.

*For Tuning Units STU-2WA, STU-3WA, STU-4WA and STU-5WA only.

(3) Adjust the BRIGHTNESS control, 15, until a trace appears on the CRT screen. Adjust the VERT POS control, 8, until the trace is located approximately one-half inch below the center line of the CRT graticule. This will be used as the base line. The HOR POS,6, and HOR GAIN, 5, are adjusted for a maximum horizontal trace.

(4) Place the DISPERSION control, 10, in the maximum clockwise position, and adjust the VERT GAIN control, 7, until the noise amplitude displayed on the CRT screen is approximately one-quarter of an inch.

(5) Place the MARKER AMPLITUDE control, 21, in the maximum clockwise position. Set the FREQUENCY DIFFERENCE MC dial, 18, to zero by turning the COARSE, 19, and VERNIER, 20, controls. This places the marker pip at the electrical center of the display. If the marker pip is not visible or is not centered on the CRT screen, adjust the CENTER FREQUENCY control, 4, until the pip is properly centered on the display baseline. For a desired marker height, adjust the MARKER AMPLITUDE control, 21.

3-4. ANALYSIS OF SIGNAL.

A. General.

(1) Connect the signal under test to the DIRECT RF INPUT, 32, (if signal is less than -30 dbm) or to the ATTENUATOR RF INPUT, 31,** (if signal is greater than -30 dbm.

**In the Models STU-1WA and STU-3WA only, it is also necessary to patch from ATTENUATOR OUTPUT to DIRECT RF INPUT.

(2) Adjust the TUNING control, 29 , until a pip representing the incoming r-f signal, appears at the center of the CRT screen. If the display is excessively large, adjust the VERT GAIN control, 7 , to reduce gain and suppress noise simultaneously. Adjust the RF ATTENUATOR control, 30 , for a suitable signal amplitude. If the signal amplitude is still excessive with maximum r-f attenuation, adjust the VERT GAIN control, 7 .

(3) Adjust the DISPERSION controls, 10 and 11, for the desired spectrum dispersion. These controls set the band of frequencies covered by the sweep oscillator circuit. The LOW-HIGH control, 10 , selects the dispersion range. The frequency dispersion range in the LOW position is 200 kc to 10 mc, and in the HIGH position it is 3 mc to 70 mc (usable range up to 80 mc) except in the Model STU-1WA RF Tuning Unit which permits a maximum dispersion of 25 mc above 55 mc. Below 55 mc the dispersion should be reduced to less than 5 mc by switching the LOW-HIGH, 10 , control to LOW. The DISPERSION's outer control varies the frequency dispersion within the selected range.

(4) Adjust the MARKER AMPLITUDE control, 21 , until a pip is visible on the CRT screen. Switch to the LOW dispersion range, and adjust the CENTER FREQUENCY control, 4 , until pip is centered. Turn the DISPERSION control, 11 , gradually counterclockwise for a more critical adjustment. Switch to the HIGH dispersion range, and turn the DISPERSION control, 11 , fully clockwise.

B. Determining the Frequency of an Applied R-F Signal.

The spectrum display indicates increasing frequency of input signal from left to right. Note that rotating the TUNING control, 29 , to a higher frequency while maintaining a fixed input signal will cause the trace on the CRT screen to move left.

(1) Set the marker pip to the electrical center of the display as directed in step (5), paragraph 3-3.

(2) Slowly rotate the TUNING control, 29 , until the signal pip merges with the marker pip. The frequency of the r-f signal under test is now read directly from the FREQUENCY dial, on the tuning unit. It is important to determine which of the calibrated scales is to be read and to distinguish between the true signal and the image. Proceed as follows: Set the DISPERSION control, 10 , maximum clockwise, and rotate the TUNING control, 29 , in the direction of a higher frequency; and note the movement of the pip. If the pip moves to the left, it is the true signal. If the pip moves to the right, it is the image. The true signal pip will then be found 320 mc higher than the image. If the signal pip moves off scale, read the high range scale. If the signal pip moves 10 mc, read the low range scale. If the pip remains stationary on the screen, it is a spurious response due to a signal falling within the i-f passband (125-195 mc.)

C. Determining the Width of any Lobe of a Signal Spectrum.

(1) Note that the FREQUENCY DIFFERENCE MC dial, 18 , is calibrated from -40 to +40 mcs. Vary the FREQUENCY DIFFERENCE MC dial, 18 , using the COARSE, 19 , and the VERNIER, 20 , controls until the marker pip is coincident with one edge of the lobe whose width is to be measured. Record dial reading.

(2) Adjust the COARSE, 19, and the VERNIER, 20, controls until the marker pip is coincident with the other edge of the lobe being measured. Record dial reading.

(3) The difference in megacycles between the settings of the FREQUENCY DIFFERENCE MC dial, 18, in steps (1) and (2) is the width of the particular lobe appearing in the display.

D. MEASURING FREQUENCY DIFFERENCE.

The procedure described in paragraph C is also applicable to measuring frequency difference between any two signals appearing in the CRT display.

E. MEASURING THE INCIDENTAL FM OF AN APPLIED SIGNAL.

(1) Vary the DISPERSION control, 10, to set the main lobe to three-quarters of the CRT's screen diameter.

(2) Using the marker pip, calibrate the bandwidth from one side of the scale to the other. Divide the bandwidth figure by 10 to find the frequency change-per-scale division.

(3) Set the SWEEP SPEED control, 3, to minimum (maximum counterclockwise).

(4) Draw two lines to indicate the pulse envelope, as shown by lines A and B, in Figure 2. Draw a horizontal line C from one side of the envelope to the other. Drop two vertical lines D and E to the base from the two points on the inner edges of the envelope crossed by the horizontal line C.

(5) Count the number of divisions between lines D and E at the base. Use the frequency change-per-scale division derived in step (2) above to calculate the frequency change. This frequency change represents the incidental FM of both the applied signal and that inherent within the spectrum analyzer.

(6) To determine the FM of the applied signal, it will be necessary to measure the incidental FM of the spectrum analyzer and to take this incidental FM and its phase angle into consideration. The incidental FM of the analyzer can be measured by following the procedure for measuring the incidental FM of an applied signal, as outlined above, except in this case the applied signal should be the output of a CW generator free of FM.

F. SPECTRA OF PULSE-MODULATED SIGNALS.

The pulse-width calibration of the marker applies to amplitude modulated rectangular pulse.

(1) Set both the COARSE, 19, and VERNIER, 20 , controls of the FREQUENCY DIFFERENCE MC dial, 18 , to zero.

(2) Adjust the TUNING control, 29 , to set the peak of the main lobe coincident with the marker.

(3) Adjust the COARSE, 19 , and VERNIER, 20 , controls until the marker is at next zero (where the lobe meets the base-line), and read pulse width on the orange PULSE WIDTH MICROSECONDS scale of the FREQUENCY DIFFERENCE MC dial.

(4) Alternatively, the r-f signal may be tuned to set one of the zeroes coincident with the marker zero, and then tune the marker to the succeeding minor lobe zero.

Figure 3 illustrates the spectra resulting from certain types of pulse modulation.

E. Bandwidth Control.

The BANDWIDTH control is located on the lower right hand side of the Display chassis's front panel. Its function is to resolve signals which may exist within 2 kc to 80 kc (3 db down) of the tuned frequency CRT display.

This variable bandwidth from 2 kc to 80 kc is accomplished with two crystal bridge networks located between the 3rd and 4th mixers on the Narrow Band I-F chassis. Both crystal bridges are variable-tuned from narrow band to wide band by the BANDWIDTH control which consists of a dual potentiometer located on the front panel. See figure 17 for a schematic diagram of the circuitry.

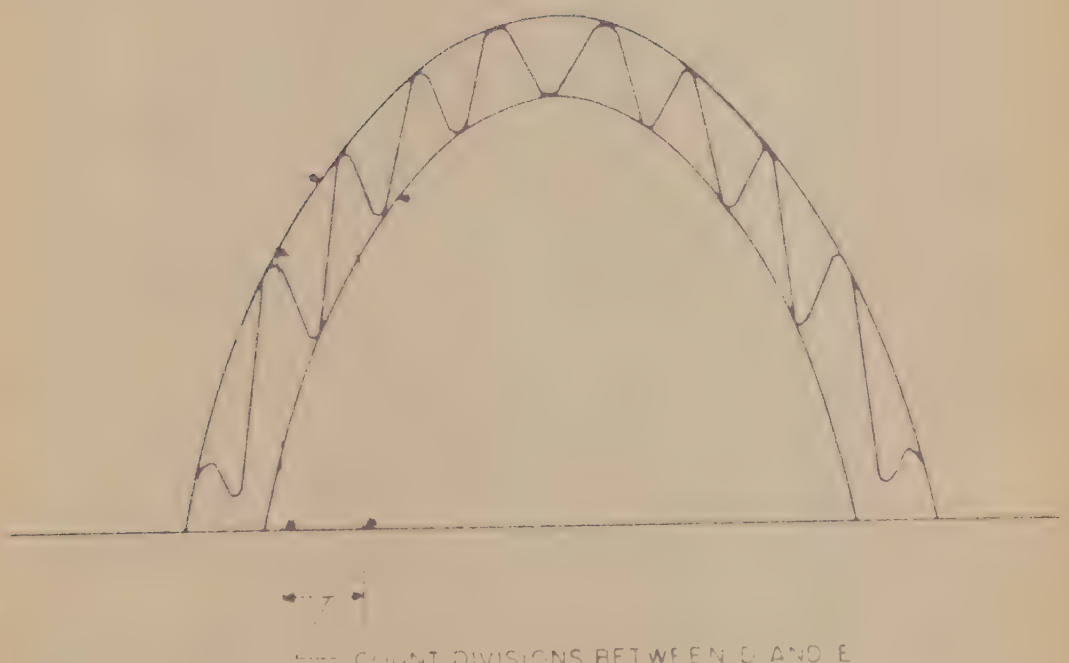

FIGURE 2. MEASURING INCIDENTAL F M

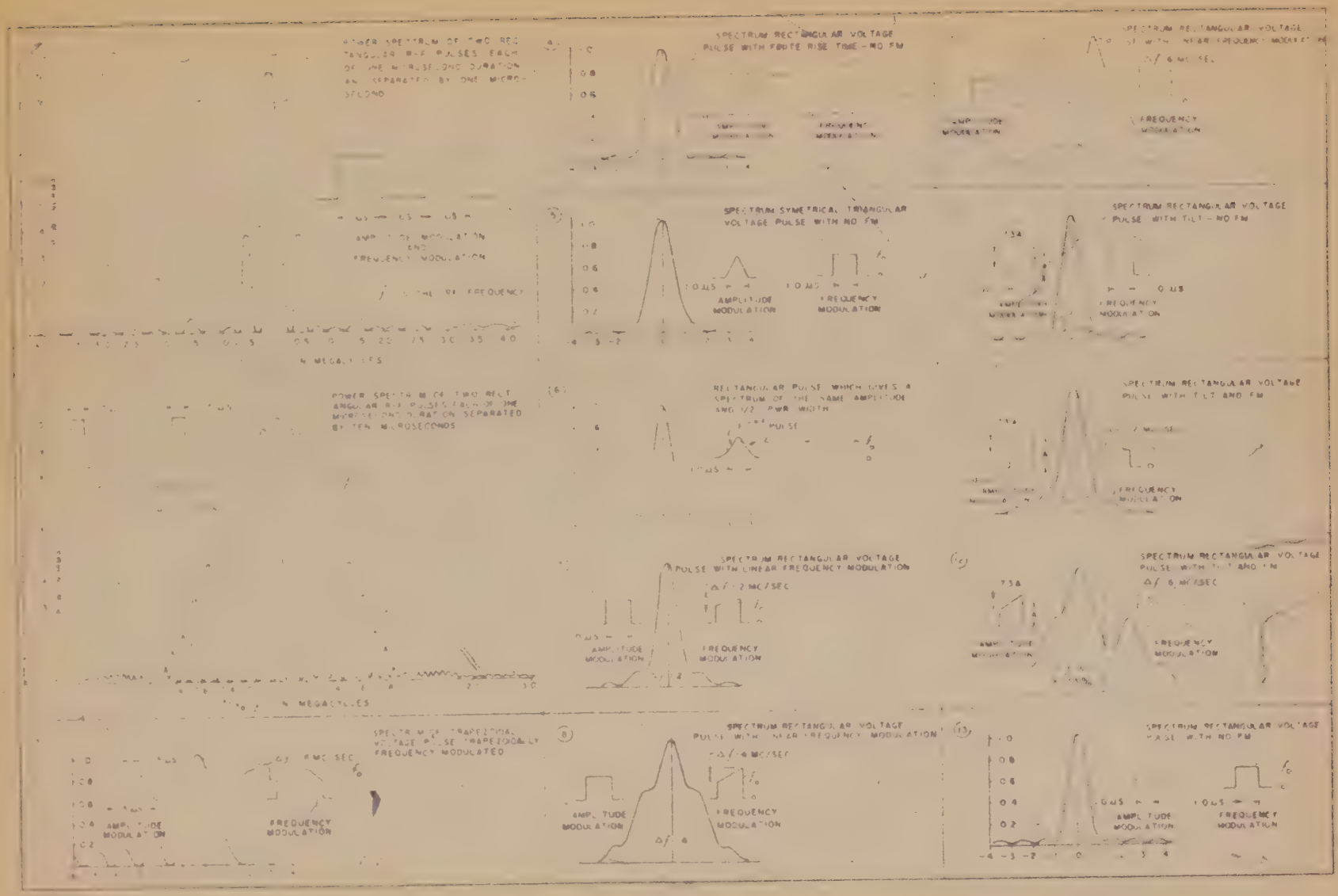
SPECTRUM RECTANGULAR VOLTAGE PULSE WITH FINITE RISE TIME – NO FM
SPECTRUM SYMETRICAL TRIANGULAR VOLTAGE PULSE WITH NO FM
SPECTRUM RECTANGULAR VOLTAGE PULSE WITH TILT – NO FM
RECTANGULAR PULSE WHICH GIVES A SPECTRUM OF THE SAME AMPLITUDE AND 1/2 PWR WIDTH
SPECTRUM RECTANGULAR VOLTAGE PULSE WITH LINEAR FREQUENCY MODULATION
SPECTRUM RECTANGULAR VOLTAGE PULSE WITH NEAR FREQUENCY MODULATION
SPECTRUM TRAPEZOIDAL VOLTAGE PULSE TRAPEZOIDALLY FREQUENCY MODULATED
SPECTRUM RECTANGULAR VOLTAGE PULSE WITH NO FM
AMPLITUDE MODULATION
FREQUENCY MODULATION
N MEGACYCLES

Figure 3. Applied Pulse vs Power Spectra

SECTION IV

DIAGRAMS

4-1. GENERAL.

This section contains the following schematic diagrams which are essential aids to the maintenance of the Model TSA-W Spectrum Analyzer:

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13.	R-F Tuning Unit, Model STU-2WA (910 mc to 4560 mc)	26
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C-12935
SERIAL NOS. 107, 124, 126, 127, 128, 129, 131, 134, 136, 146, 148, 404, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 465, 466, 467, 468 AND 500 THRU 554.
TSA-W

TEST POINT JACK (REAR OF CHASSIS)
J104

P104

TO RF TUNING UNIT J104

E A F B N P R J V T M S L F L K H D

X X T103

RECTIFIER V101 5R4

T102 11 12

T102 13 14

C101 .4UF 2KV

C102 .4UF 2KV

RECTIFIER V102 5R4

S104 115/230 SWITCH VOLT

1 6C 2 6B 1 5C 2 5B 4 4C 3 4B 2 3C 1 3B 2 2C 1 2B 2 1C 1 1B

K102

K101 115N060T

J127 POWER INPUT

PART OF J125

V103 807

R101 0Ω

R100 0Ω

T103

R106 220K

VOLTAGE REGULATOR V106 0A2

500V

R103 0Ω

V104 807

R118 150 1%

R113 100

SERIES REGULATORS

R114 220K

R102 470K

R122 22K 2W

ANODE VOLTS ADJ

R123 50K 2W

R116 3.3K 1W

325V ADJ

R117 50K

DC AMPLIFIER V105 12AX7

R119 33K 1W

R104 33K 1W

R112 30K 10W

R115 82K 2W

R110 30K 10W

R121 82K 2W

R109 30K 10W

R108 6.8K 2W

R105 8200 2W

R107 6.8K 2W

C104 .5UF 2KV

V107 0A2

V108 0A2

V109 0A2

V110 0A2

R124 25K 10W

R125 25K 10W

C114 .05UF 1.6KV

VOLTAGE REGULATORS

C103 2UF 3KV

P128

J128

SERIES REGULATORS

DC AMPLIFIERS

V113 6080

V111 6080

V114 6080

V116 12AX7

V117 12AX7

V115 12AX7

VOLTAGE REGULATOR V118 5651

SERIES REGULATOR V112 5881

V101-2

V101-8

V102-2

V102-8

+300V

+25V

-150V

C109 40UF

PART OF J125

TO CHASSIS FRAME HARNESS (P125)

W → CRYSTAL CURRENT

Z → RELAY STU-1W

X →

CC → +300V

EE →

FF →

DD → GRD

BB → +125V

AA → -150V

U, V → D-C FIL SUPPLY

S, T →

P, R →

M, N →

K, L →

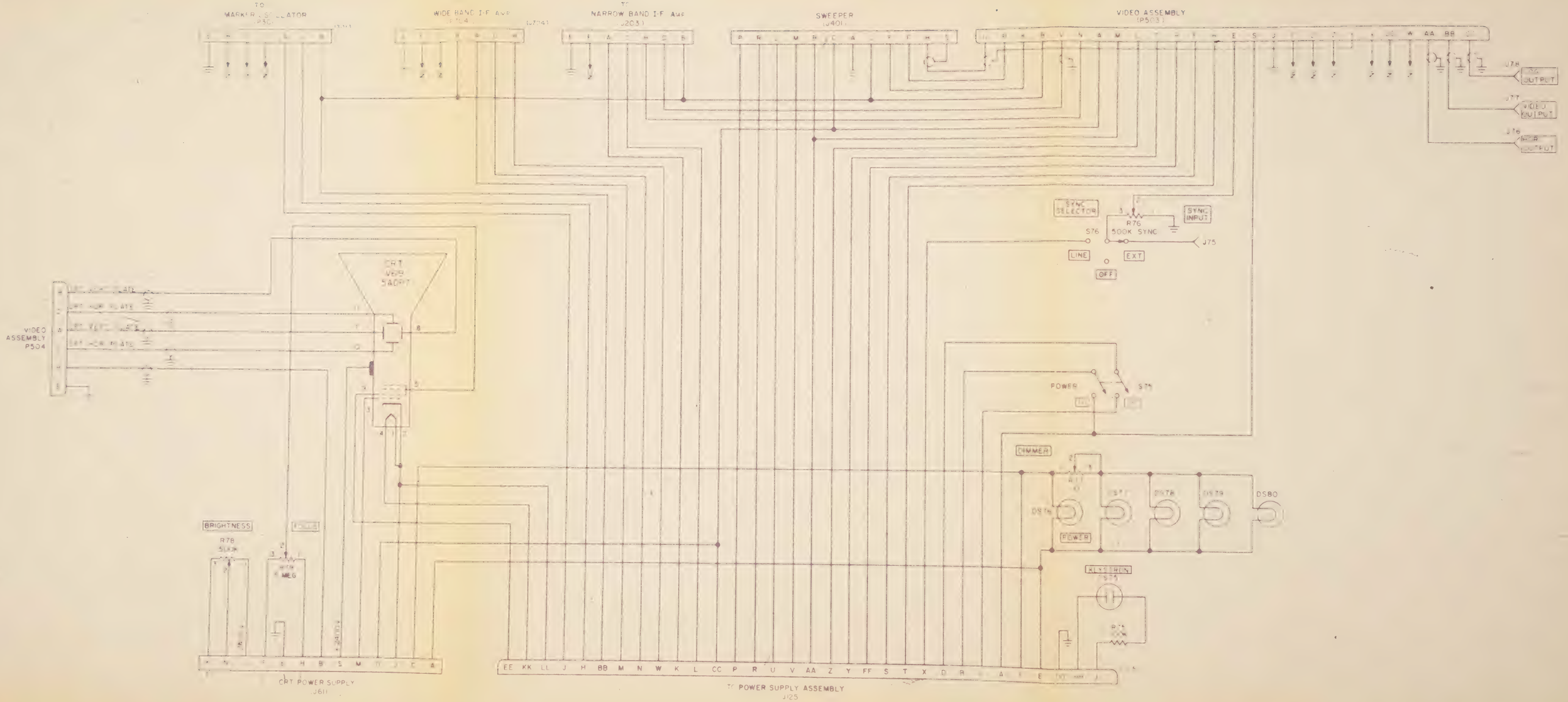
H, J →

KK, LL →

E, F →

HH, JJ →

FIGURE 4. POWER SUPPLY, SCHEMATIC DIAGRAM



146, 148, 404, 432, 453, 454, 455, 456, 457, 458, 459, 460, 461, 465, 466, 467, 468 AND 500 THRU 554; C130993

FIGURE 5. CHASSIS FRAME HARNESS SCHEMATIC DIAGRAM

AMPLIFIER

V201
6AK5

CONVERTER

V202
6BE6

CONVERTER

V203
6BE6

64MC INPUT
(P201 ON W92)

J201

L202
64MC

L205
29MC

L209
500KC

L213
5.5MC

C205
43

C206
1000

C208
1000

C223
1000

C224
180

C227
47

C229
0.01
UF

C228
0.01
UF

C221
330

R207
220K
1W

R208
10

R206
22K

FE201

FE202

FE203

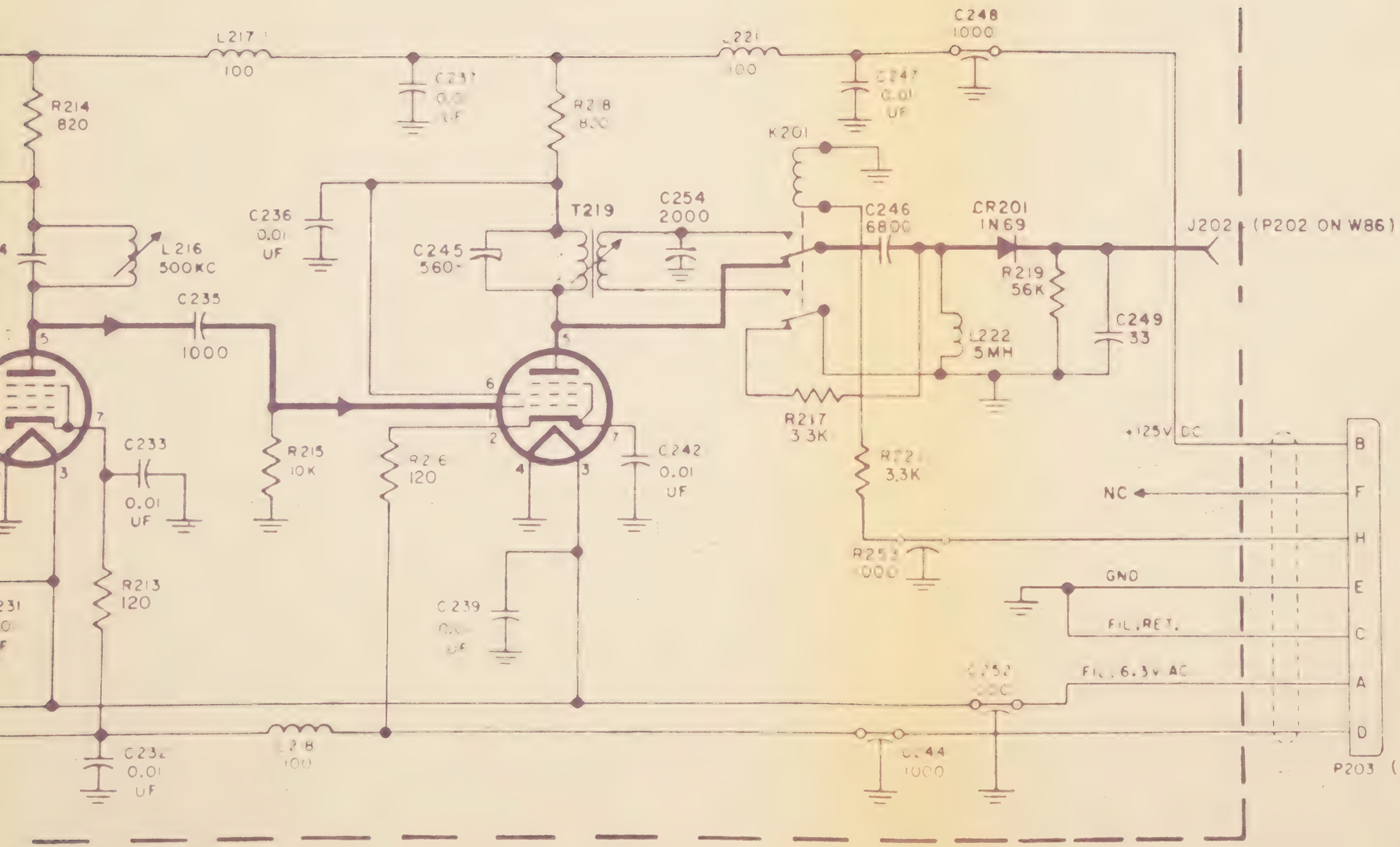
SERIAL NOS. 107, 124, 126, 127, 128, 129, 131, 134, 136, 146, 148, 404, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 465, 466, 467, 468, AND 500 THRU 554.
D-126891

PLIFIER

V204
6AG5

AMPLIFIER

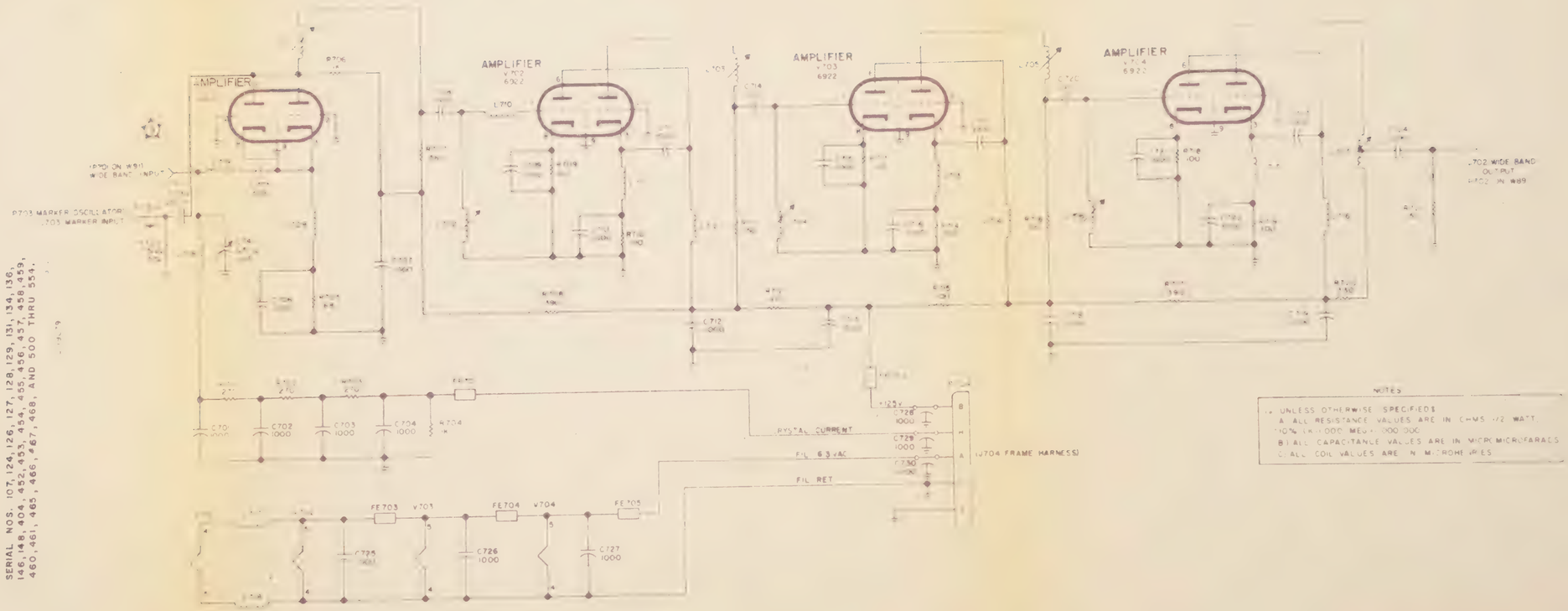
V205
6AG5



NOTES

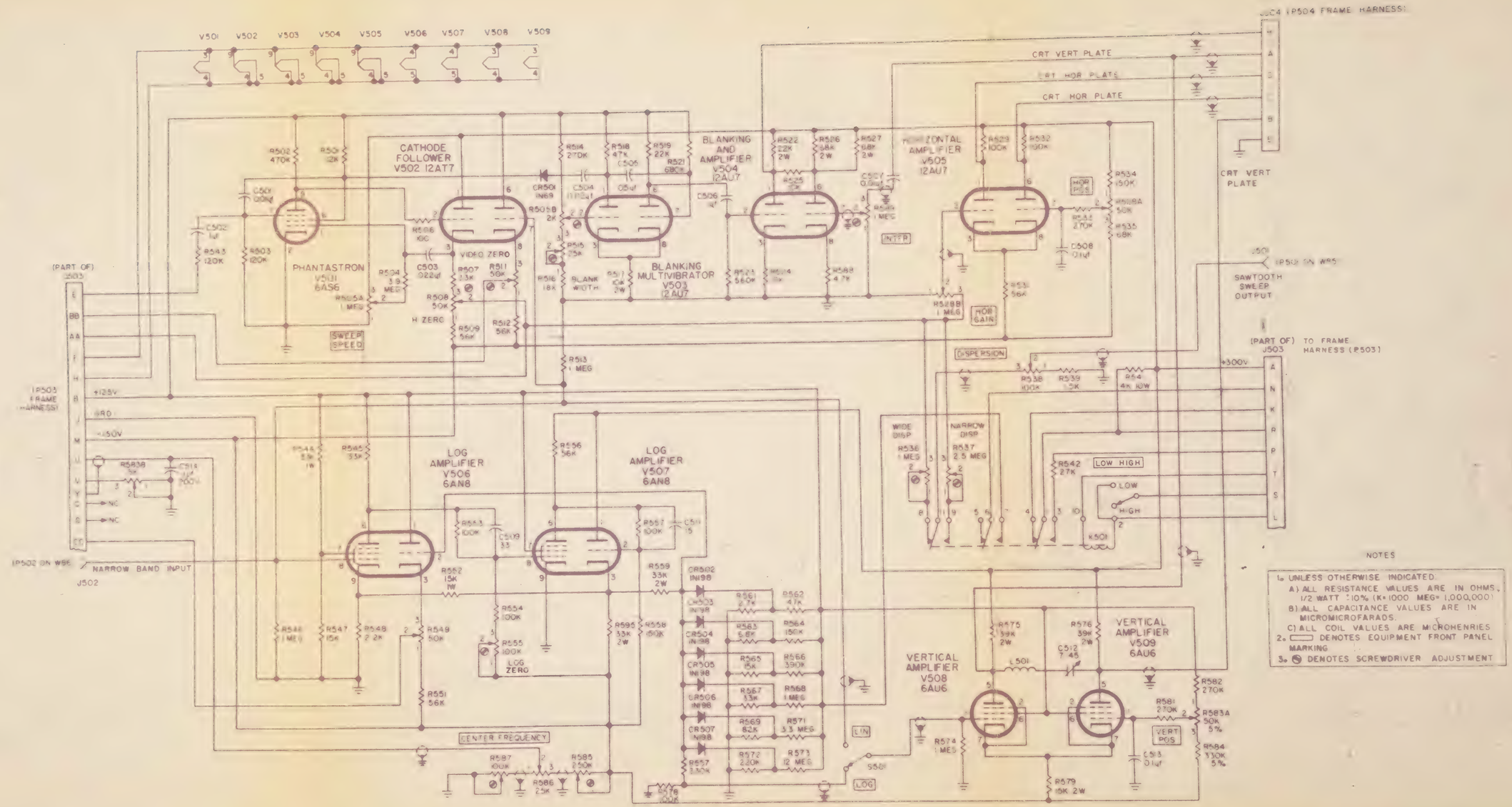
1. UNLESS OTHERWISE INDICATED:
   A) ALL RESISTANCE VALUE ARE IN OHMS, 1/2 WATT, ±10% (K=1000)
   B) ALL CAPACITANCE VALUES ARE IN MICROMICRO-FARADS
   C) ALL COIL VALUES ARE IN MICROHENRIES
2. ⟶ DENOTES SIGNAL PATH.

FIGURE 6. NARROW BAND I-F AMPLIFIER SCHEMATIC DIAGRAM



SERIAL NOS. 107, 124, 126, 127, 128, 129, 131, 134, 136, 146, 148, 404, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 465, 466, 467, 468, AND 500 THRU 554.

FIGURE 7. WIDE BAND IF AMPLIFIER, SCHEMATIC DIAGRAM

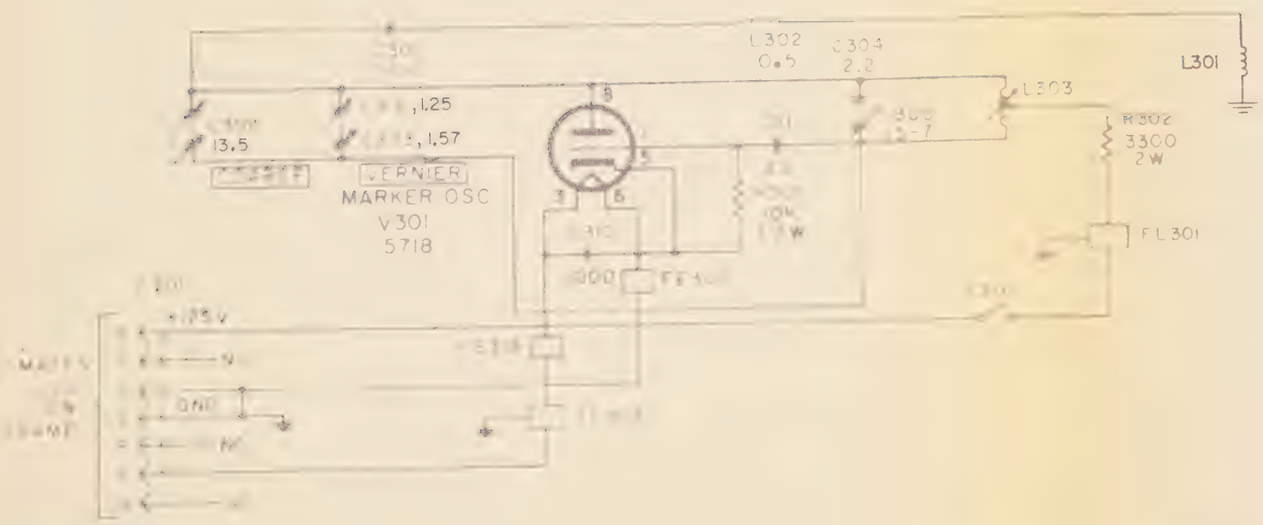


NOTES

1. UNLESS OTHERWISE INDICATED:
   A) ALL RESISTANCE VALUES ARE IN OHMS, 1/2 WATT ±10% (K=1000 MEG=1,000,000)
   B) ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS.
   C) ALL COIL VALUES ARE MICROHENRIES.
2. ▭ DENOTES EQUIPMENT FRONT PANEL MARKING.
3. ⊘ DENOTES SCREWDRIVER ADJUSTMENT.

FIGURE 8. VIDEO AMPLIFIER, SCHEMATIC DIAGRAM

SERIAL NOS. 107, 124, 126, 127, 128, 129, 131, 134, 136, 146, 148, 404, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 465, 466, 467, 468, AND 500 THRU 554.



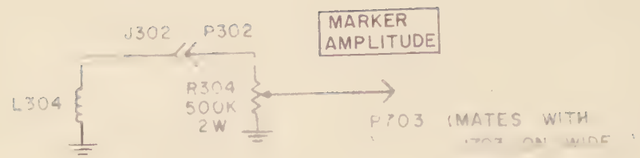


FIGURE 9. MARKER OSCILLATOR, SCHEMATIC DIAGRAM

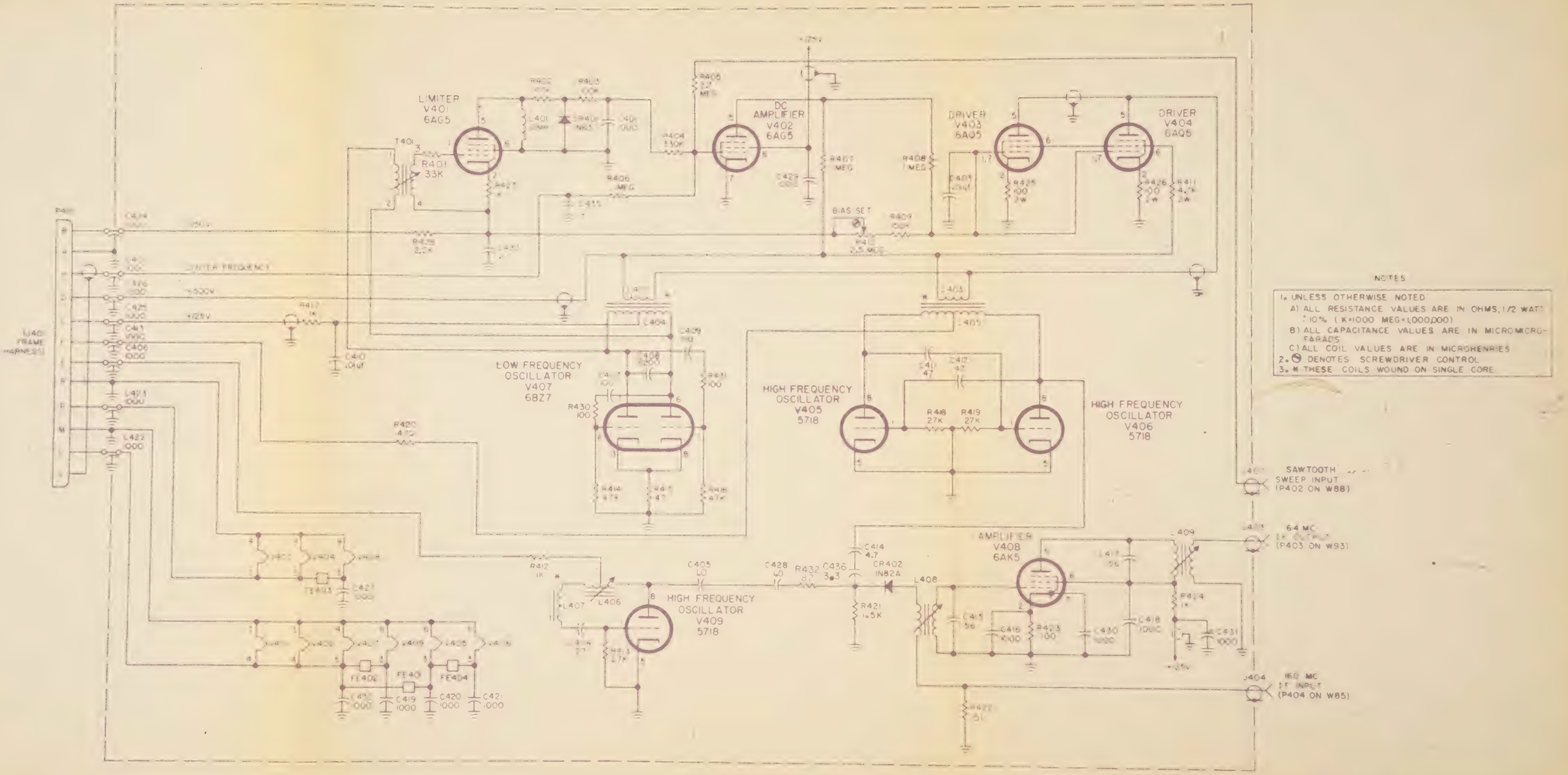
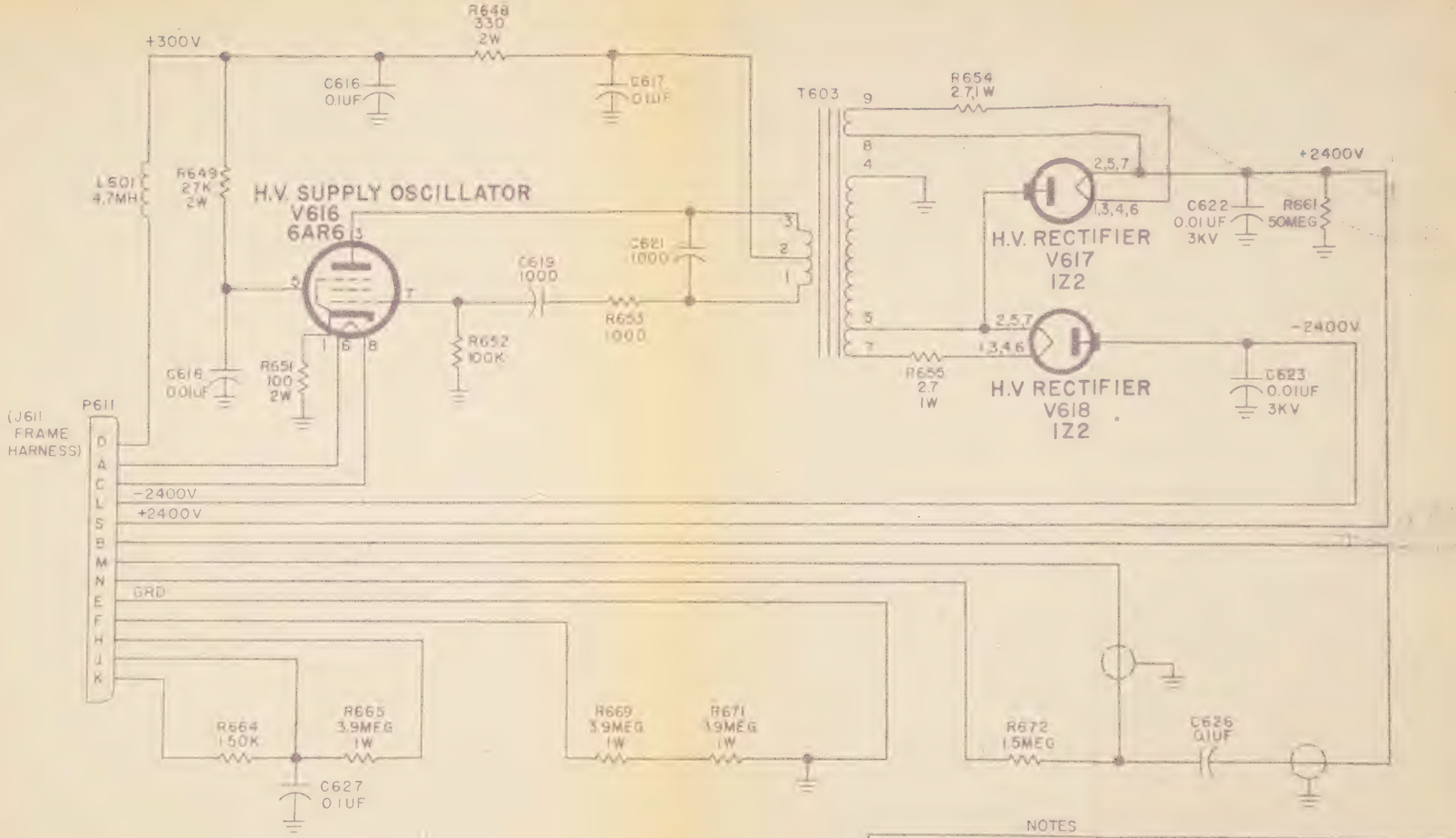

SERIAL NOS. 107, 124, 126, 127, 128, 129, 131, 134, 136, 146, 148, 404, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 465, 466, 467, 468, AND 500 THRU 554.
LIMITER V401 6AG5
DC AMPLIFIER V402 6AG5
DRIVER V403 6AQ5
DRIVER V404 6AQ5
BIAS SET
LOW FREQUENCY OSCILLATOR V407 6BZ7
HIGH FREQUENCY OSCILLATOR V405 5718
HIGH FREQUENCY OSCILLATOR V406 5718
HIGH FREQUENCY OSCILLATOR V409 5718
AMPLIFIER V408 6AK5
CR402 IN82A
SAWTOOTH SWEEP INPUT (P402 ON W88)
64 MC IF OUTPUT (P403 ON W93)
160 MC IF INPUT (P404 ON W85)
NOTES
1. UNLESS OTHERWISE NOTED:
A) ALL RESISTANCE VALUES ARE IN OHMS, 1/2 WATT ±10% (K=1000 MEG=1,000,000)
B) ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS
C) ALL COIL VALUES ARE IN MICROHENRIES
2. ⊖ DENOTES SCREWDRIVER CONTROL
3. * THESE COILS WOUND ON SINGLE CORE

FIGURE 10. SWEEP FREQUENCY GENERATOR, SCHEMATIC DIAGRAM

SERIAL NOS. 107, 124, 126, 127, 128, 129, 131, 134, 136, 146, 148, 404, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 465, 466, 467, 468, AND 500 THRU 554.



NOTES

1. UNLESS OTHERWISE INDICATED:
   A) ALL RESISTANCE VALUES ARE IN OHMS, 1/2 WATT, ±10%
      (K=1000, MEG=1,000,000)
   B) ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS

FIGURE 11. R-F OSCILLATOR POWER SUPPLY, SCHEMATIC DIAGRAM

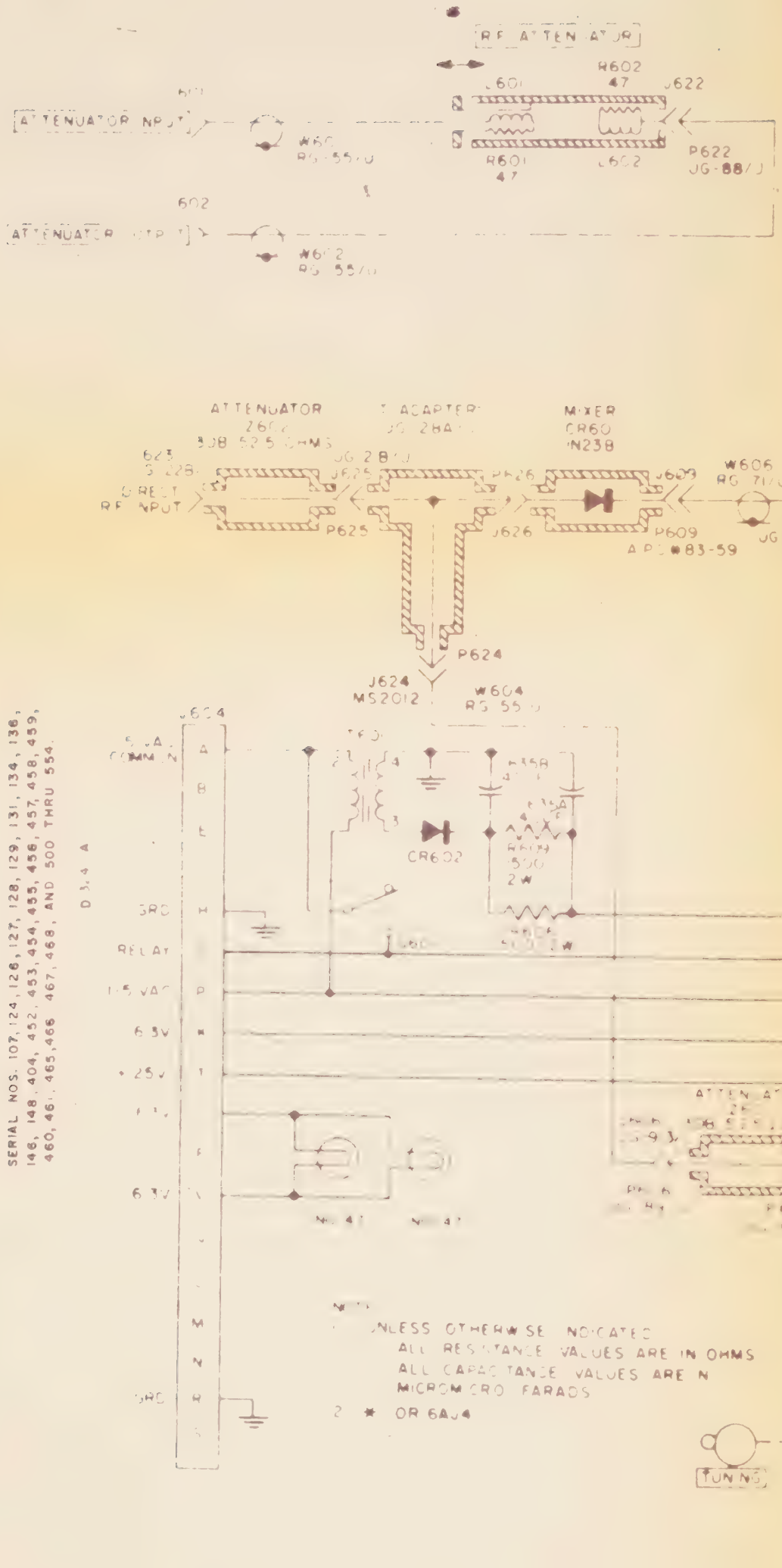
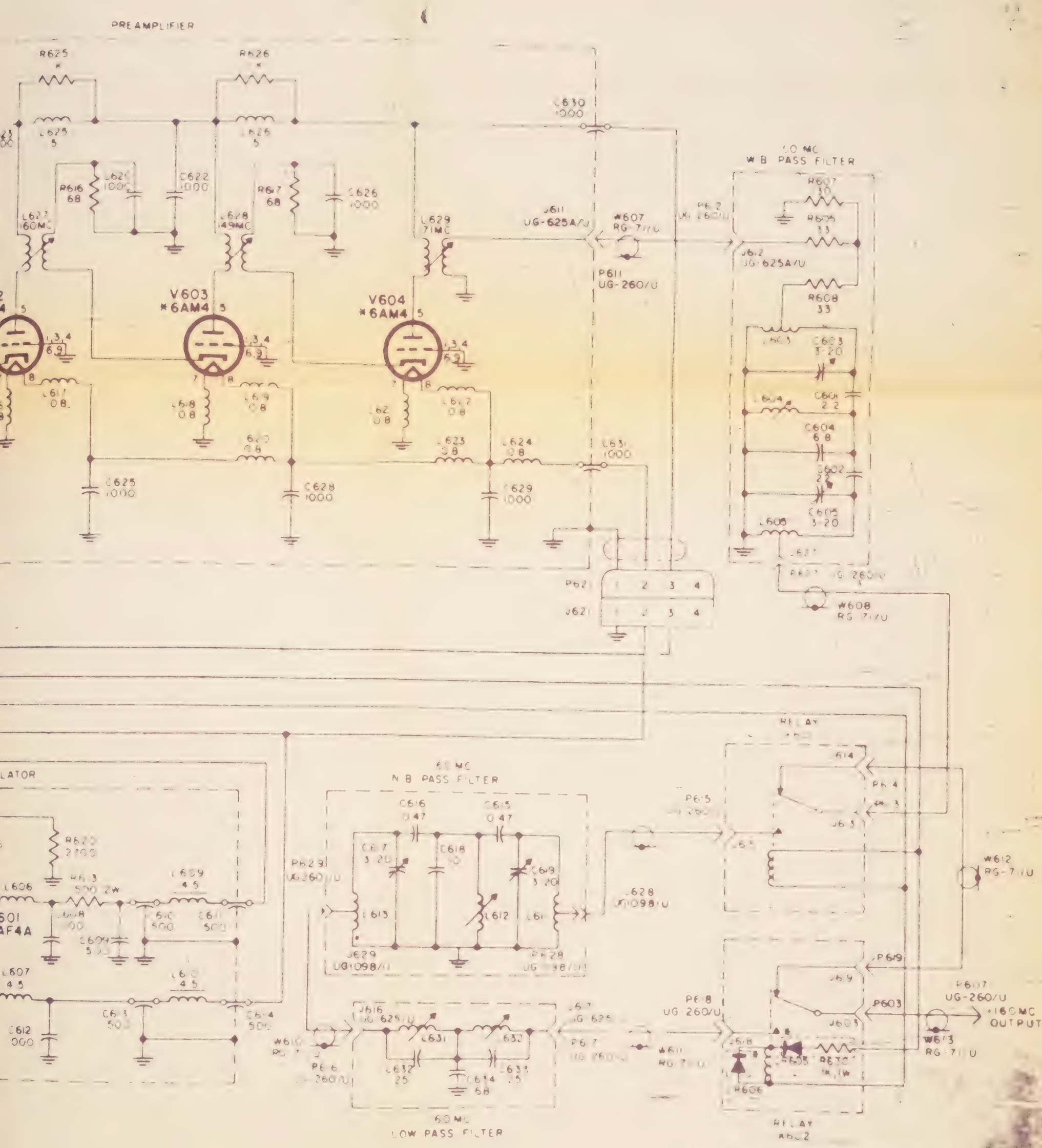


Figure 12. R-F Tuning



* SERIAL WAS SER NO 421 AND UP ONLY

SERIAL NOS. 107, 124, 126, 127, 128, 129, 131, 134, 136, 146, 148, 404, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 465, 466, 467, 468, AND ABOVE D130955A

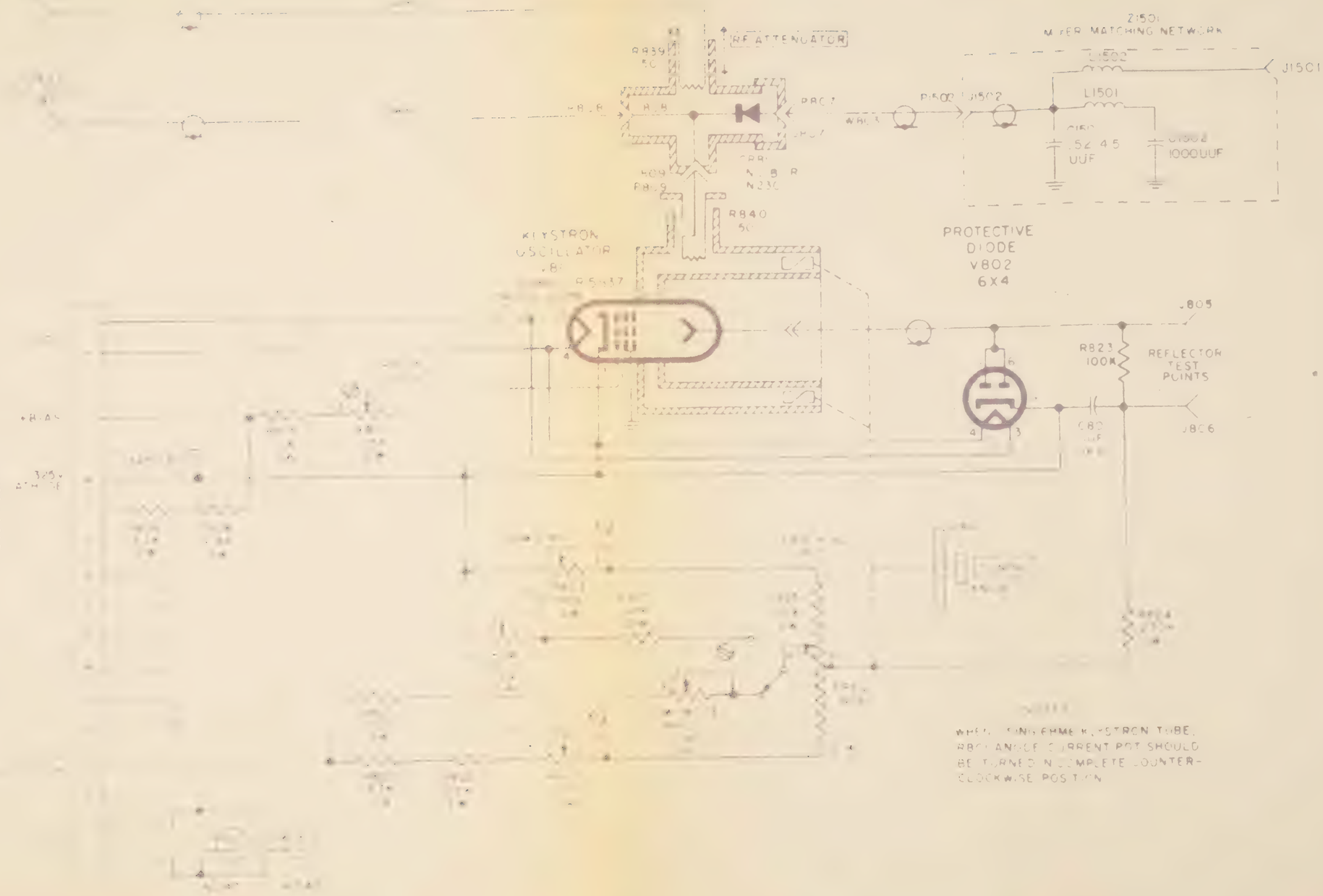


Figure 13. R-F Tuning Unit Model STU-2WA(910 mc to 4560 mc)

SERIAL NOS. 107, 124, 126, 127, 128, 129, 131, 134, 136, 146, 148, 404, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 465, 466, 467, 468, AND 500 THRU 554.

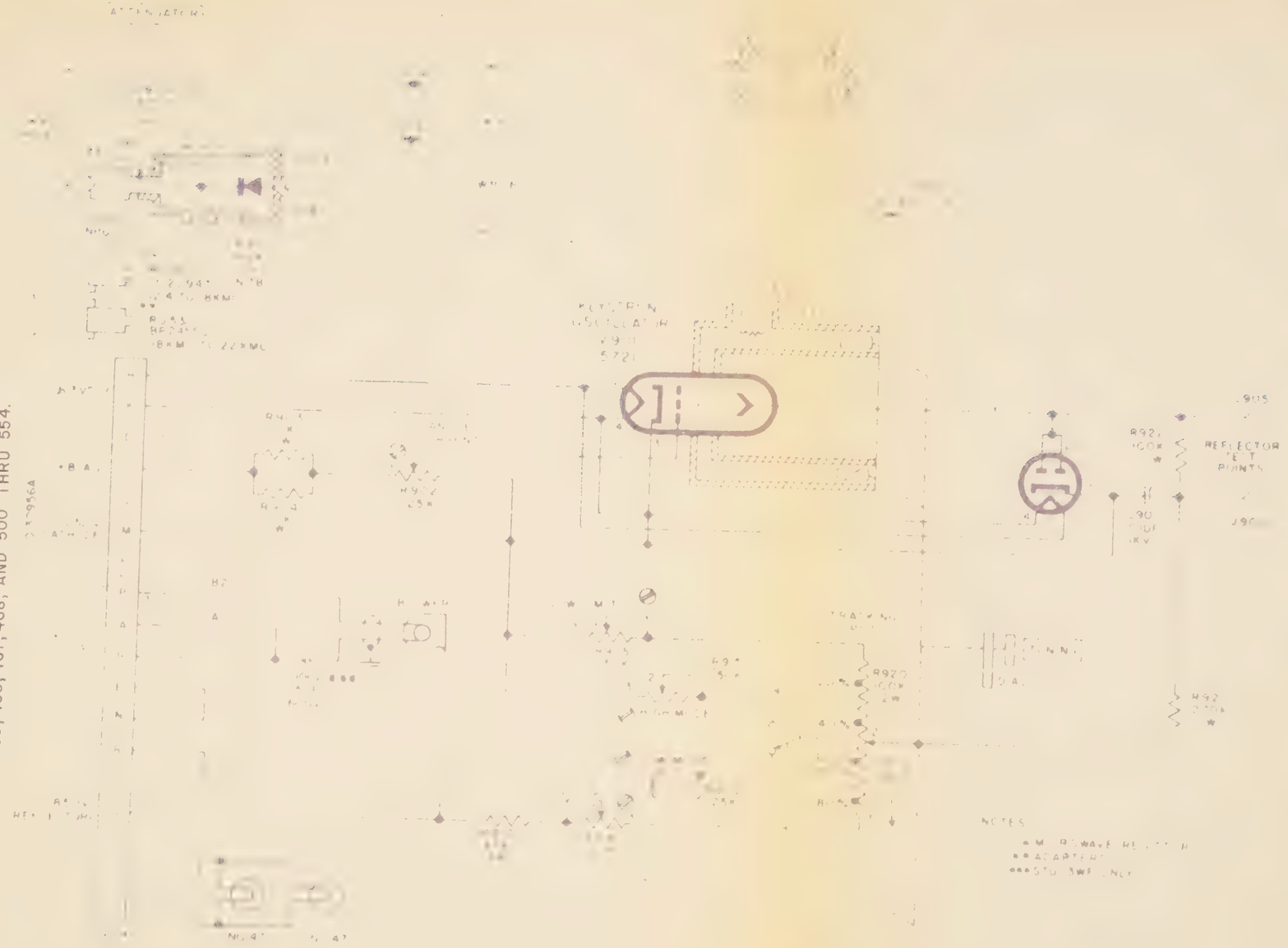


Figure 14. R-F Tuning Unit Model STU-3WA(4370 to 22000 mc)

SERIAL NOS. 107, 124, 126, 127, 128, 129, 131, 134, 136, 146, 148, 404, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 465, 466, 467, 468, AND 500 THRU 554.

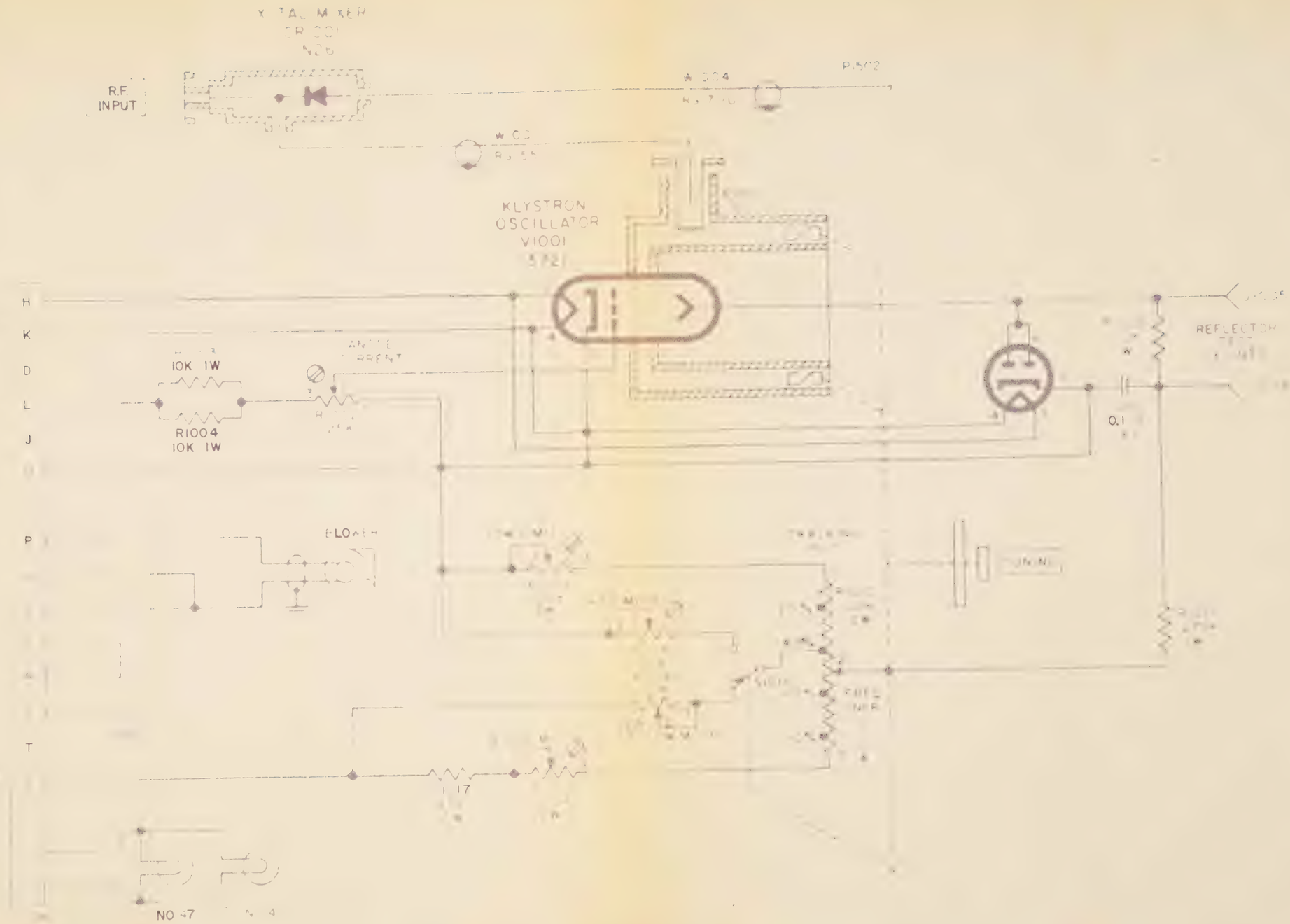


Figure 15. R-F Tuning Unit Model STU-4WA(21000 to 33000 mc)

SERIAL NOS. 107, 124, 126, 127, 128, 129, 131, 134, 136, 146
148, 404, 452, 453, 454, 455, 456, 457, 458, 459, 460,
461, 465, 466, 467, 468, AND 500 THRU 594.

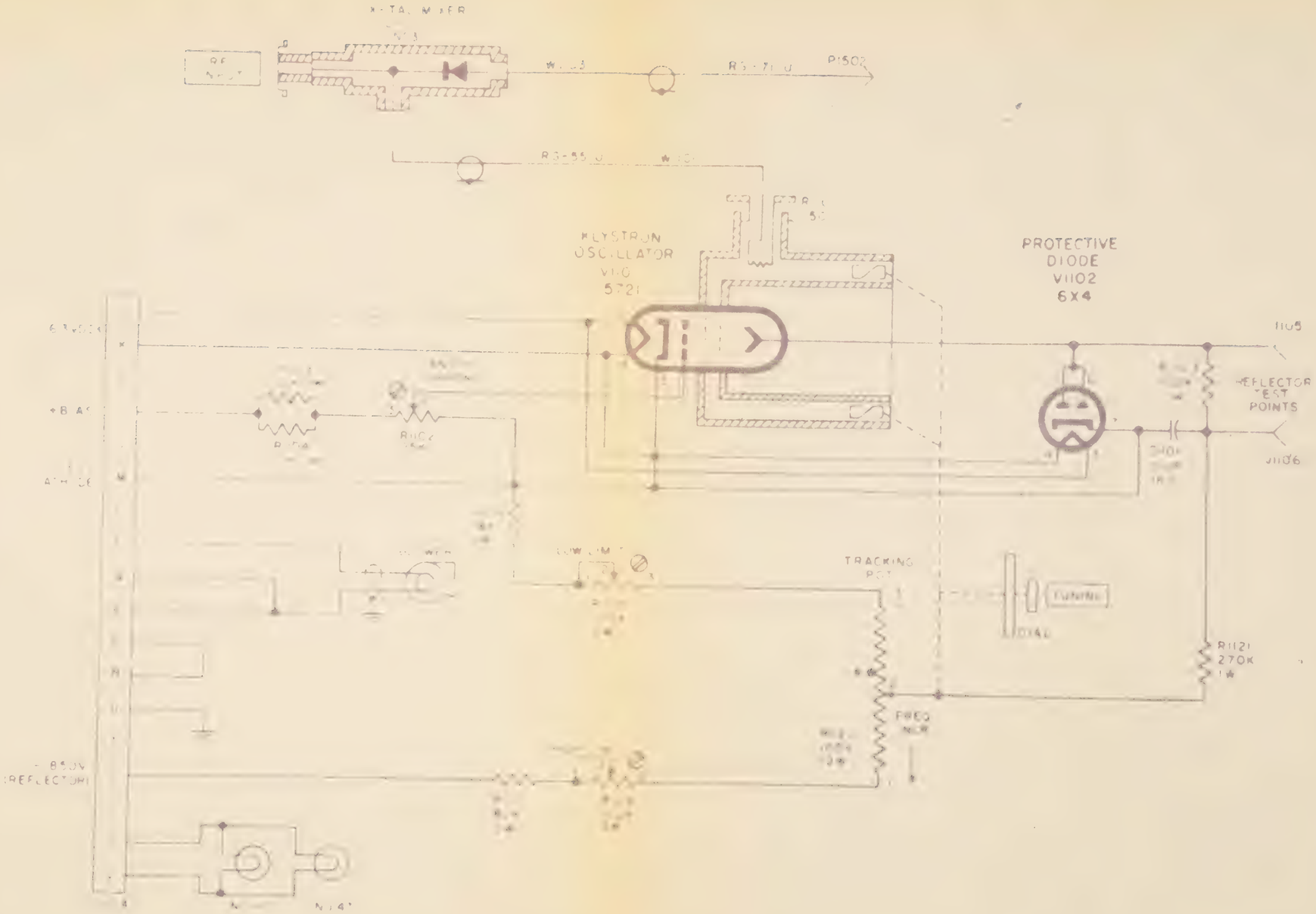
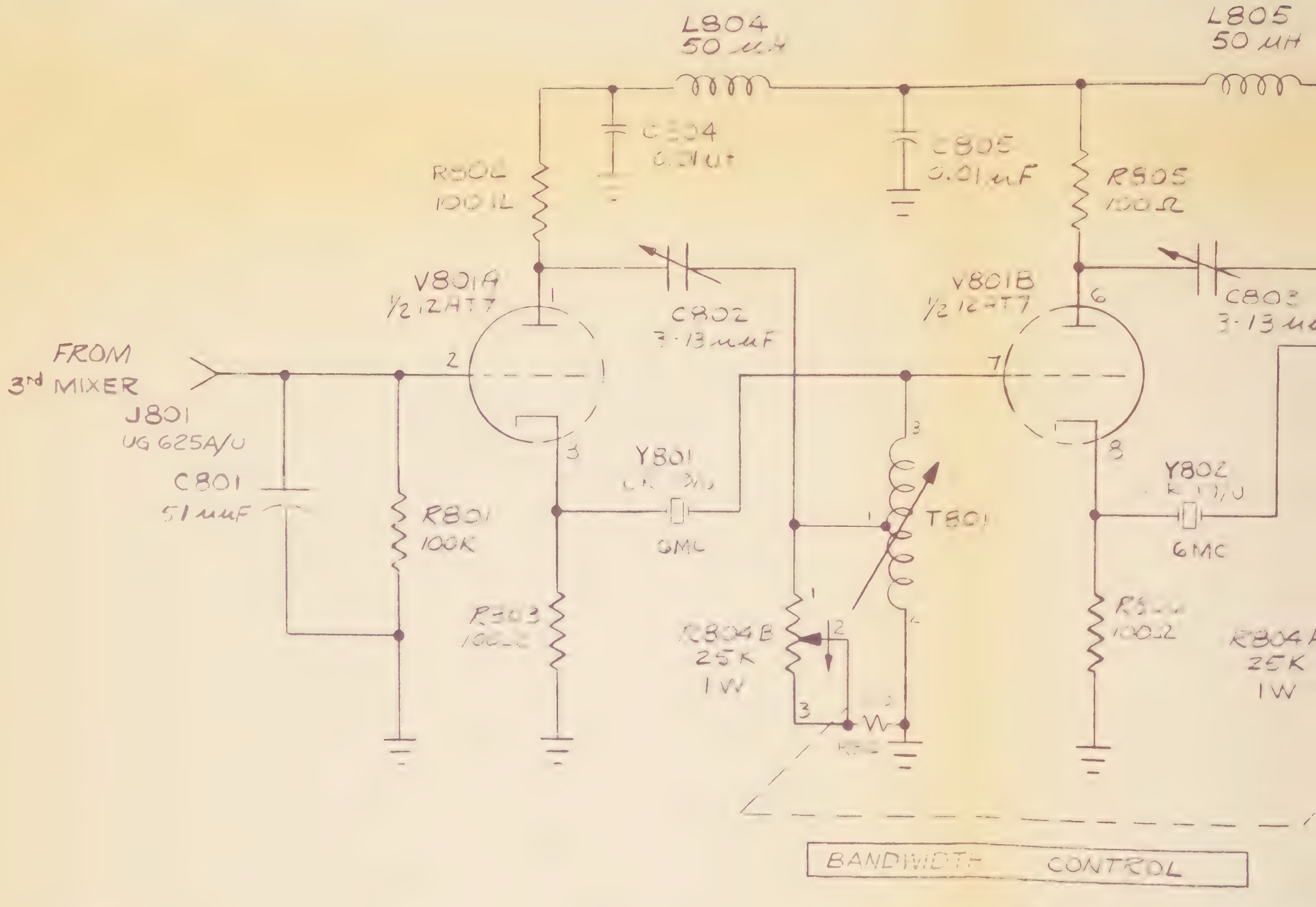


Figure 16. R-F Tuning Unit Model STU-5WA (3000 mc to 44000 mc)

D141146

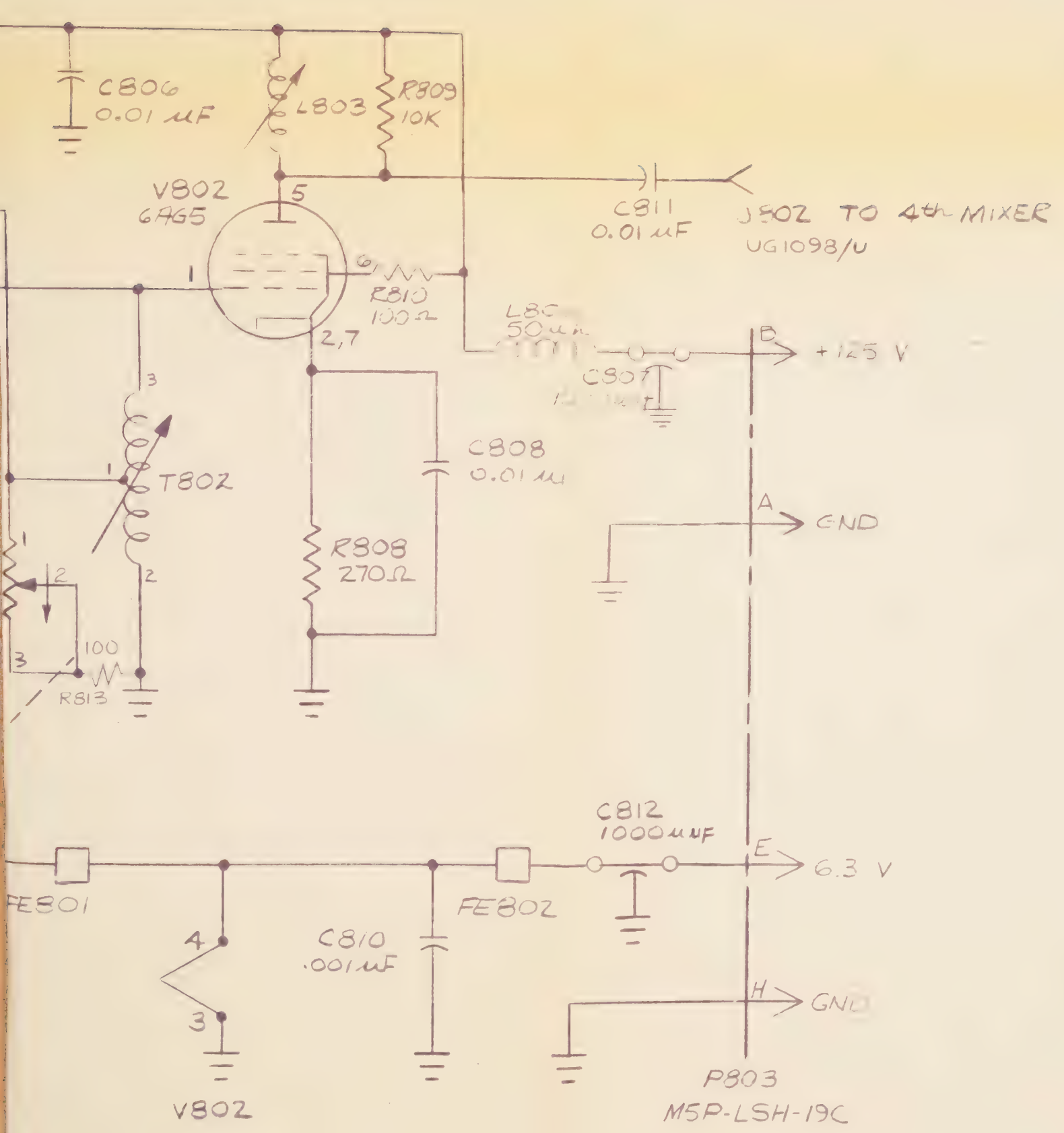


ITEM	NEXT ASSY	USED ON	NEXT ASSY	FINAL ASS'Y
		9812		
APPLICATION			QTY REQD	

OGILVIE PRESS INC. BROOKLYN 12, N. Y.

REVISIONS

ZONE	SYM.	DESCRIPTION	DATE	APPROVAL
	A	CHG'D LOCATION & VALUE OF C804 ADDED GND LEAD TO J802. THIS DWG. WAS VARIABLE CL. UNIT, (TIT-) MODIFIED TOL NOTE, R812, R813, C801 WAS 7-45 VAR. C802 WAS 7-45 DIC # 1506	1-6-60	
	B	REFELENCE DWG WAS NOTE 2. ADDED CONNECTOR DESIGNATION FOR J801 & J802	12-21-60	



ITEM	REQD	PART NO.	DESCRIPTION

LIST OF MATERIAL

UNLESS OTHERWISE SPECIFIED
SURFACE 63 FINISH
DIMENSIONS ARE IN INCHES
TOLERANCE ON
FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES ± 1°
REMOVE BURRS & SHARP CORNERS
MATERIAL
FINISH

DRAWN BY V.Pennick DATE 7-18-60
DESIGNED BY DATE
CHECKED BY DATE
APPROVED BY DATE 11-
RELEASED BY DATE 12-21-60
CODE

CONTROL AMPLIFIER
IF BANDWIDTH
SCHEMATIC DIAGRAM

SCALE NONE

POLARAD
ELECTRONICS CORPORATION
L. I. CITY NEW YORK

SIZE C | 141446 | SYM D

C 141446

POLARAD ELECTRONICS CORP.

CONSULTANTS — DESIGNERS — MANUFACTURERS

43-20 34th Street Long Island City 1, N. Y.

EXeter 2-4500

REQUEST FOR MAINTENANCE

FROM:

COMPANY NAME _____ DATE: _____

ADDRESS: _____ INDIVIDUAL _____

_____ POSITION _____

SECTION OR DIVISION _____ PHONE NO. _____ EXT. _____

_____

EQUIPMENT _____ DATE OF PURCHASE _____

MODEL _____ SERIAL NO. _____ ORDER NO. _____

_____

TROUBLE REPORT:

A. Description of trouble _____

_____

_____

_____

_____

_____

B. Has trouble been localized? _____ If so, how and where: _____

_____

_____

_____

_____

_____

C. Instruments used and measurements taken, if any: _____

_____

_____

_____

D. Is trouble intermittent? _____

E. Hours of operation prior to this trouble _____

F. Date trouble occurred _____

G. Was factory consulted by telephone or letter prior to this request? _____

If so, give date and person to whom directed: _____

_____

H. Additional Comments: _____

_____

_____

_____

_____

_____

_____

When trouble develops requiring factory assistance, complete this form and send to:

Polarad Electronics Corporation
43-20 34th Street
Long Island City 1, New York
ATTENTION: Service Department

After this report has been analyzed by the Service Department, you will be notified when a field service engineer will call on you to make the necessary repairs. If your trouble can best be corrected at the factory, we will so notify you with instructions and authorization for returning the equipment.

NO EQUIPMENT MAY BE RETURNED TO THE FACTORY WITHOUT WRITTEN AUTHORIZATION

POLARAD

POLARAD GUIDE TO MICROWAVE EQUIPMENT

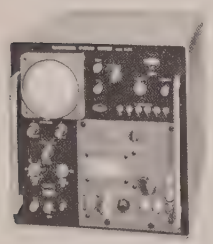
MICROWAVE SPECTRUM ANALYZERS 10 to 100,000 mc

FEATURING:

- 1 to 30 cps adjustable sweep rate
- Direct-reading UNIDIAL® tuning control, with no klystron modes to set
- High accuracy, resolution and sensitivity
- Frequency dial accuracy ±1%
- Non-contacting klystron cavity chokes for noiseless tuning
- Five-inch flat-face CRT
- Provision for use with Multi-pulse Spectrum Decoder (Model SD-1)

TRANSISTORIZED MULTI-BAND, SINGLE UNIT SPECTRUM ANALYZER

Complete Frequency Coverage, From 10 to 40,880 mc



Model SA-84T

Completely transistorized lightweight unit.

Dispersion: 500 kc to 25 mc, adjustable

Resolution: 20 kc at all frequencies

Internal Marker: ± 13 mc

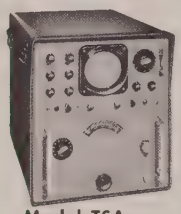
Power Input: 115/230 VAC, 50/60 cps or 12 VDC

Power consumption: when battery operated, 110 watts

Sensitivity: —50 to —105 dbm, depending on frequency.

Weight: 70 lbs. One half the weight of conventional vacuum-tube equivalent

Meets MIL-1-26600 for r-f interference



Model TSA

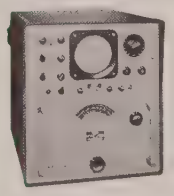
DIRECT READING SPECTRUM ANALYZER

10 to 44,000 mc in 5 Plug-In Tuning Units

To test missiles, radar, microwave components, telemetering and multi-pulse transmission

Features:

- **Dispersion:** 400 kc to 25 mc
- **Resolution:** 2 to 80 kc variable
- **Attenuation:** Continually variable
- **Sensitivity:** —50 to —95 dbm, depending on frequency
- Internal Marker: ± 14 mc



Model TSA-S

COMBINATION SYNCHROSCOPE-SPECTRUM ANALYZER

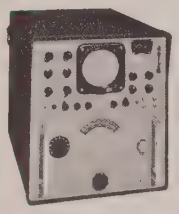
10 to 44,000 mc in 5 Plug-In Tuning Units

PROVIDES TIME AND FREQUENCY DISPLAYS

Time Display: Shows signal waveform

Frequency Display: Shows power vs. frequency

Bandwidth: 5 kc, 50 kc, 500 kc, 5 mc. Synchroscope sweep rate: 2, 10, 100, 1,000, 10,000 and 100,000 μsec per screen diameter. Dispersion, Sensitivity and Internal Marker same as TSA.

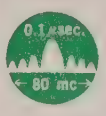


Model TSA-W

WIDE DISPERSION SPECTRUM ANALYZER

FOR NARROW AND WIDE PULSE ANALYSIS

10 to 44,000 mc in 5 Plug-In Tuning Units



Dispersion: 200 kc to 80 mc (2 ranges)

Resolution: 2 to 80 kc variable

Internal Marker: ±40 mc

Screen Display: Linear or log

80 mc dispersion displays pulses narrow as 0.1 μ sec. For wide pulses, dispersion may be adjusted down to 200 kc.

UNIVERSAL SPECTRUM ANALYZERS

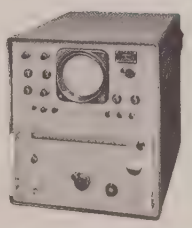
Complete frequency coverage 10-40,880 mc in single self-contained units—no additional tuning units required. Expanded, direct-reading, slide rule dial

Model SA-84

- **Dispersion:** 10 to 55 mc: 500 kc to 5 mc, adjustable 55 to 40,880 mc: 500 kc to 25 mc, adjustable
- **Resolution:** 20 kc
- **Internal Marker:** variable

Model SA-84W
Wide Dispersion

- **Dispersion:** 10 mc to 240 mc: 10 mc 240 mc to 40,800 mc: 80 mc
- **Resolution:** 2 kc to 80 kc variable
- **Crystal controlled markers from 10 to 40,880 mc**
- **Log-linear display**
- **Accurately calibrated IF attenuator**

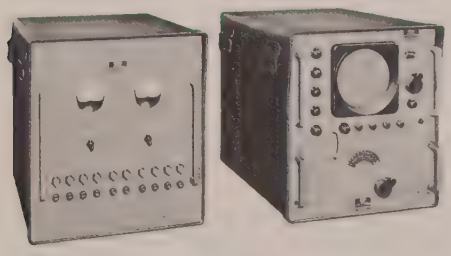


WIDE BAND SPECTRUM ANALYZER

Self-Contained Unit Covers 10 to 40,000 mc in 20 Bands

- **Dispersion:** 1 mc to 25 mc in narrow band 50 mc to 4000 mc in wide band
- **Resolution:** 20 kc in narrow band 1.5 mc in wide band
- Rapid band selection by means of illuminated push-button switches.
- Frequency marker up to 4000 mc.
- End-markers indicate frequency limits of each band.
- Center-marker permits switching from wide to narrow bands without hunting for r-f signal.
- **Sensitivity:** —50 to —80 dbm, depending on frequency.

Model WSA



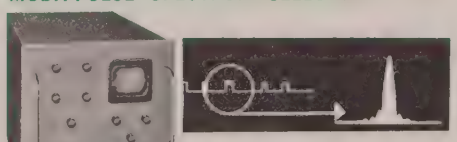
Model DA-70

100 KMC SPECTRUM ANALYZER

Covers 50,000 mc to 100,000 mc in Three Bands

- **Dispersion:** Continuously adjustable from 50 mc to 1000 mc. Permits narrow pulse inspection.
- **Resolution:** 1 mc
- High intermediate frequency assures image rejection and prevents video detection.
- **Frequency marker:** for measuring frequency differences.
- **Dial frequency Accuracy:** ±1.0%
- **Nominal Sensitivity:** —50 dbm for entire frequency range.

MULTI-PULSE SPECTRUM SELECTOR



Model SD-I

Permits spectrum analysis of individual microwave pulses in a pulse group when used with any Polarad Spectrum Analyzer. Any pulse in a complex coded signal may be isolated for examination.

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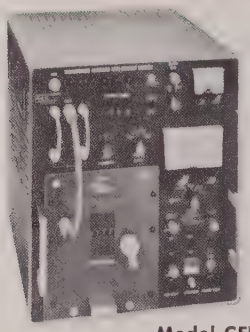
A GUIDE TO MICROWAVE ELECTRONIC TEST INSTRUMENTS

MICROWAVE RECEPTION

TRANSISTORIZED CALIBRATED FIELD INTENSITY RECEIVER



Model CFI

1,000 to 10,000 mc

Four Interchangeable Plug-In Tuning Units Cover All Frequencies.

Transistorized, low power drain, ruggedized field intensity receiver provides accurate measurements of frequency and absolute power level of conducted or radiated microwave energy. Combines a Field Intensity Calibrator, a Monitor and Power Unit and a Calibrated Antenna System. The Model CFI covers 950 to 11,260 mc when used as a microwave receiver.

FEATURES:

- Built-in power inverter for use with 12 volt DC source.
- Direct-reading frequency dial.
- Output level: read directly in db.
- Audio, video and recorder outputs.
- AM, FM, CW and PULSE reception.
- One third lighter than equivalent vacuum-tube Field Intensity Receiver.
- Calibrated antenna system includes an omni-directional band antenna and separate directional antennas to match each tuning unit.

Sensitivity:
—90 dbm.

Frequency Dial Accuracy:
±1%

Maximum RF input:
3 volts

Impulse Bandwidth:
1 mc, 5 mc and 8 mc

Image and Spurious Response Rejection:
Better than 60 db

CALIBRATED MICROWAVE FIELD INTENSITY RECEIVER

Model FIM

1,000 to 10,000 mc

Two compatible tuning units under development will extend frequency to 20,000 mc.

Indicates Absolute Power Level By Comparing Input Signal Against Internally Generated Signal In A Single Unit.

Four Interchangeable Plug-In Tuning Units Cover All Frequencies.

- Only Microwave Field Intensity Receiver with self-contained signal generator which calibrates entire system under test at any level.
- First single microwave test system to determine radiated r-f interference and susceptibility.
- Front-panel meter indicates average, peak, slide-back peak or quasi-peak value of r-f signals. Outputs for video, audio and recorder.
- Direct-indicating peak VTVM for ease of frequency location of impulse noise.
- Single UNIDIAL® tuning control tunes both the receiver and signal generator.
- Calibrated antenna system includes an omni-directional broad band antenna and separate directional antennas to match each tuning unit.

Frequency Dial Accuracy:
±1%

Maximum RF Input:
3 volts

Sensitivity:
—80 dbm

Impulse Bandwidth:
5 mc

Image and Spurious Response Rejection:
Better than 60 db

Attenuation:
0 to 80 db in steps of 1 db

TRANSISTORIZED MICROWAVE RECEIVER

Fully Transistorized Circuitry Ensures Low Power Drain and Rugged Construction. One-third lighter than equivalent vacuum-tube receiver.

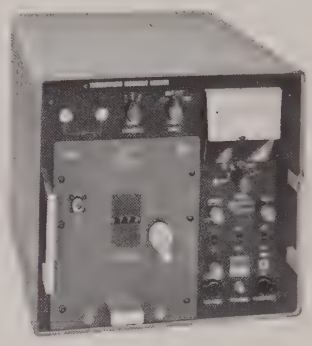
950 mc to 11,260 mc

Four Plug-In r-f Tuning Units Cover All Frequencies.

Four Instruments In One.

- AM, FM, CW, MCW, Pulse receiver
- Field intensity receiver
- Pulse, pulse-time or pulse-position demodulator
- Sensitive power meter

- Power consumption when battery operated, 180 watts. Built in power inverter for use with 12 volt DC battery source.
- AFC and AGC circuits.
- Audio, video and recorder outputs.
- Output level: read directly in db.



Model TR

Frequency Dial Accuracy: ±1%
Impulse Bandwidth:
1 mc, 5 mc, or 8 mc
Image Rejection: Better than 60 db
Video Bandwidth: 3.5 mc
Sensitivity: —90 dbm

MICROWAVE RECEIVER

400 to 84, 200 mc

Nine Interchangeable Plug-In Tuning Units Cover the Frequency Range.

Four Instruments In One.

- AM, FM, CW, MCW Pulse receiver
- Field intensity receiver
- Pulse, pulse-time or pulse-position demodulator
- Sensitive power meter

For quantitative analysis of microwave signals, and monitoring of all types of radio and radar communication.

Model R

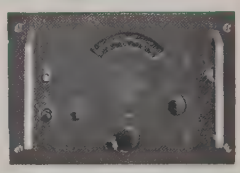
Features: UNIDIAL® control with direct-reading frequency dial. AFC and AGC. Audio, video, recorder and trigger outputs. Output level read directly in db.

Frequency Dial Accuracy: ±1%
I-F Bandwidth: 3 mc
Video Bandwidth: 2 mc
Image Rejection: Greater than 60 db to 11,260 mc
Range of Linearity: With AGC, 60 db
Sensitivity: —55 to —90 dbm, depending on frequency

ANTENNA PATTERN TUNING UNIT 2,000 to 75,000 mc

Designed For Use With Model R Receiver

- **External Mixer With Flexible Cable.** May be located at or near antenna, any distance up to 75 feet from receiver.
- **Internal electronic 1000 cps sweep** allows direct operation into any standard make AC antenna pattern recorder.



Model RW-T

TRANSISTORIZED MICROWAVE IMPULSE GENERATOR

1,000 cps to 10,000 mc

Model IC-120

For use with microwave receivers when making field intensity measurements, as a signal source for spectrum analyzers, in noise measurements, and other applications. Generates 0.020 nanosecond pulses.

CALIBRATED ANTENNAS

1,000 to 10,000 mc

and

TEST ANTENNAS

1,000 to 40,000 mc

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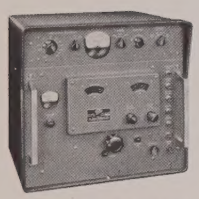
A GUIDE TO MICROWAVE ELECTRONIC TEST INSTRUMENTS

MICROWAVE SIGNAL GENERATION EQUIPMENT 500 to 50,000 mc

500 to 21,000 mc. Polarad signal generators in this range feature: Continuously variable attenuators calibrated directly in —dbm. Internal pulse, FM and square wave modulation, external pulse and multi-pulse modulation. Delayed and undelayed sync outputs. UNIDIAL® tuning. Direct-reading frequency dials accurate to ± 1%. High stability non-contacting klystron cavity chokes for noiseless tuning and accurate calibration.

UHF SIGNAL GENERATOR

500 to 1,000 mc



Model PMR

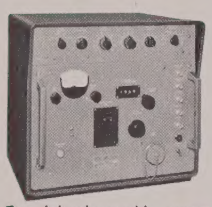
Single unit covers entire frequency range.

Internal pulse (40-4,000 pps), and square wave modulation (10-10,000 pps.) Internal FM with interchangeable modulator.

Calibrated output: 0 dbm (1 mw) to —127 dbm.

MICROWAVE SIGNAL GENERATOR

10,000 to 21,000 mc



Model PMK

Two interchangeable generator units.

Internal pulse and square wave modulation (10-10,000 pps.) Output to 10 mw. DIGITAL frequency indicator.

Calibrated power output: +10 dbm (10 mw).

MICROWAVE SIGNAL SOURCE

1,050 to 11,000 mc

in 4 interchangeable tuning units.

Model KSS

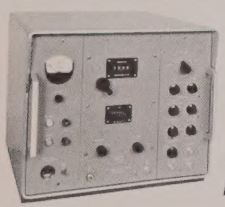
A stable source of microwave energy at relatively high power output level. Internal square wave 10-10,000 pps. External pulse, square wave or FM modulation. Adjustable attenuator.

Power output: 14 to 400 mw, depending upon frequency.

ULTRA-BROADBAND MICROWAVE SIGNAL GENERATOR

4,200 to 11,000 mc

in one instrument



Model MSG-34

Internal pulse and square wave modulation (10-10,000 pps.) 0 to —127 dbm attenuator output.
DIGITAL frequency indicator.

MICROWAVE SIGNAL GENERATOR

4,450 to 11,000 mc

Model PMX

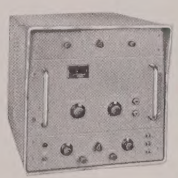
Two interchangeable r-f generator units.

Internal pulse and square wave modulation (10-10,000 pps.) 0 to —127 dbm attenuator output.

MICROWAVE SWEEP GENERATOR FOR INSTANTANEOUS MICROWAVE ANALYSIS 1,000 to 16,000 mc

At single frequency or over a wide range

in 5 interchangeable tuning units. Provides high-power microwave signal adjustable from single frequency to 2:1 frequency range. .001 to 100 cps sweep rate. Int. mod.: 1,000 cps and 456 kc square wave. Ext. mod.: square wave, FM and pulse.



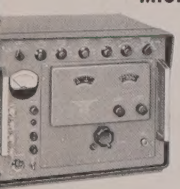
Model CSG

RAPID SCAN RATIO SCOPE

Model VS-2A

Displays ratio of two input signals, gives visual plot of VSWR as function of frequency, at a single frequency or over an entire sweep range. Calibrated 7" CRT. For use with Model CSG.

MICROWAVE SIGNAL GENERATORS



Model MSG

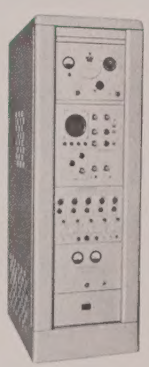
	Frequency	Calibrated Power Output	Internal Pulse Modulation: Internal Square Wave	Width in μ sec.	Pulse Repetition Rate in pps	Delay in μ sec.	FM deviation in mc minimum
MSG-1	950-2,400 mc	1 mw (0 dbm)	40- 4,000 pps	0.5-10	40- 4,000	2.5-300	±2.5
MSG-1P*	950-2,400 mc	10 mw (+10 dbm)	10-10,000 pps	0.2-10	10-10,000	2-2,000	±2.5
MSG-1R	950-2,400 mc	1 mw (0 dbm)	10-10,000 pps	0.3-10	10-10,000	2-2,000	±2.5
MSG-2A	2,000-4,600 mc	1 mw (0 dbm)	40- 4,000 pps	0.5-10	40- 4,000	2.5-300	±2.5
MSG-2R	2,000-4,600 mc	1 mw (0 dbm)	10-10,000 pps	0.3-10	10-10,000	2-2,000	±2.5
MSG-2P*	2,000-4,600 mc	10 mw (+10 dbm)	10-10,000 pps	0.2-10	10-10,000	2-2,000	±2.5

*Attenuator Accuracy: ±3 db between 0 and +10 dbm.
±2 db below 0 dbm.

CODE MODULATED MULTI-PULSE MICROWAVE SIGNAL GENERATOR

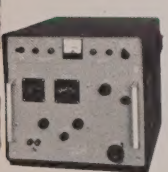
950 to 10,750 mc

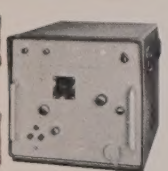
in 4 interchangeable tuning units. Provides 5 independently adjustable pulse channels, each with variable pulse width and delay. Built-in precision oscilloscope.



Model B

EHF SIGNAL GENERATORS AND SOURCES





EHF Signal Generators and Sources

12,400 to 50,000 mc. Units in this range provide cw signals, 1,000 cps internal square wave, external modulation provisions, accurate frequency calibration.
EHF SIGNAL GENERATOR 18,000 to 39,700 mc, 7 plug-in units. Accurate power calibration. EHF SIGNAL SOURCE 18,000 to 50,000 mc, 9 plug-in units. High power output.

EHF SIGNAL GENERATOR Tuning Unit	Frequency Range	EHF SIGNAL SOURCE Tuning Unit
G1822-1	18,000 to 22,000 mc	S1822-1
G2225-1	22,000 to 25,000 mc	S2225-1
G2427-1	24,700 to 27,500 mc	S2427-1
G2730-1	27,270 to 30,000 mc	S2730-1
G3033-1	29,700 to 33,520 mc	S2933-1
G3336-1	33,520 to 36,250 mc	S3336-1
G3540-1	35,100 to 39,700 mc	S3540-1
	39,600 to 46,000 mc	S4046-1
	45,900 to 50,000 mc	S4650-1

Model SG-1218 Signal Generator and **Model SS-1218 Signal Source.** Available with a frequency range of 12,400 to 17,500 mc.

MAIL THIS CARD for specifications. Ask your nearest Polarad representative (in the Yellow Pages) for a copy of "Notes on Microwave Measurements."

POLARAD ELECTRONICS CORP. BG 12

I WOULD LIKE MORE INFORMATION AND SPECIFICATIONS ON MODEL NUMBERS: (CIRCLE)

SPECTRUM ANALYZERS
TSA SA-84 DA-70
TSA-S SA-84T WSA
TSA-W SA-84W SD-1

SIGNAL GENERATORS
PMR MSG-1 MSG-2P CSG
PMK MSG-1P MSG-2R VS-2A
MSG-34 MSG-1R EHF B
PMX MSG-2A KSS

RECEIVERS
R RW-T CFI
TR FIM 1C-120
ANTENNAS

LABORATORY EQUIPMENT
PJ-1 SV-1 KLYSTRONS
N-1 P-3 MP-1A
K-200

MY APPLICATIONS ARE: _____

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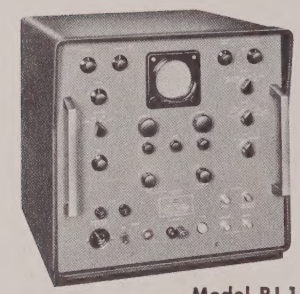
MICROWAVE LABORATORY EQUIPMENT



Model PJ-1

PULSE JITTER TESTER

Measures

Relative jitter: 5, 10 and 100 nanoseconds full scale

Pulse width jitter: 5, 10 and 100 millimicroseconds full scale

Repetition rate jitter: 5, 10 and 100 millimicroseconds and 1, 10 and 100 microseconds full scale

Displays: Jitter magnitude and Jitter waveform

CODED MULTI-PULSE GENERATOR

Provides up to five independently adjustable pulse channels for generation of precise coded multi-pulse trains. Each pulse can be independently pulse-time modulated by means of an external signal.

Modulation:

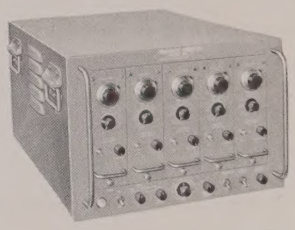
Group repetition rate, 10-10,000 cps

Individual pulses, in group:

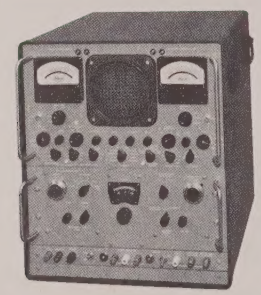
Width: 0.2 to 2 μ sec.

Delay: 0 to 300 μ sec. in two steps

Provision for pulse-time modulation



Model MP-1A



Model SV-1

SERVO-ANALYZER

Combines a precision multiple signal generator and oscilloscope. Feeds a modulated reference test signal through a servo, computer or other system circuit, and compares the response on a calibrated CRT scope. Tests amplitude, phase and transient response, response of magnetic and servo amplifiers, all AC and DC servo systems. Signal generator and oscilloscope may operate independently.

Frequency Range: .001 to 100 cps in 5 ranges.

PRECISION NOISE GENERATOR

1,000 cps to 500 mc — 1 to 20 db

Provides stable, accurate noise output to measure directly the noise figure of vacuum-tube and transistor amplifiers and receivers in the 1,000 cps to 500 mc range.
Dial Calibration: Noise figure indicated directly in db
Accuracy: $\pm$0.25 db

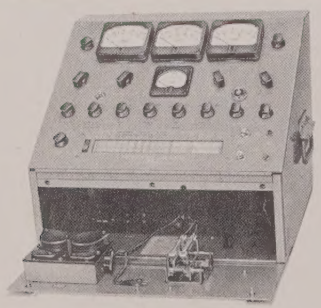
Model N-1

TRANSISTORIZED MICROWAVE POWER METER

Model P-3

10 to 40,000 mc

Measures absolute r-f power instantly. Line or internal battery operated. Rugged, weighs only 6 pounds. Five interchangeable thermistor mounts cover the frequency range. Direct readings in milliwatts or dbm. High sensitivity allows 0.01 milliwatt full-scale deflection; other ranges, up to 10 milliwatts full scale.



Model K-200

MICROWAVE TUBE TESTER

Tests both internal cavity and external cavity klystron tubes, pencil triodes, rocket tubes and lighthouse tubes. Operates as simply as conventional tube testers. Monitors cathode, anode, grid and reflector voltages and currents. Tests for shorts and filament continuity.

ALL-CERAMIC REFLEX KLYSTRON TUBES

Polarad Tube Type	Frequency Range
ZV 1012	500 to 3,000 mc
ZV 1010	700 to 3,000 mc
ZV 1010X	950 to 2,800 mc
ZV 1021X	1,000 to 4,000 mc
ZV 1009	1,500 to 6,000 mc
ZV 1009X	1,700 to 5,000 mc
ZV 1011	4,000 to 11,000 mc

X Series Klystrons have 200 mw minimum output.

Maximum shock, vibration and heat resistance. Guaranteed for operation up to 250°C; no cooling required. Low noise, stable and low microphonic operation.

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NEW YORK CITY

Home Office
Polarad Electronics Corporation
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Exeter 2-4500
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Alfred A. Goldberg
Richard J. Sheloff
Robert E. Savold

VIRGINIA
WASHINGTON, D.C.
WEST VIRGINIA

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Washington 5, D.C.
Decatur 2-8000

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EASTERN PENNSYLVANIA

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Philadelphia 26, Pa.
Waverly 7-6269

Eastern Instrumentation, Inc.
808 Ingleside Avenue
Baltimore 28, Md.
Ridgeway 4-3676

Eastern Instrumentation, Inc.
8616 Georgia Avenue
Silver Springs, Md.
Juniper 9-0100

NEW YORK STATE
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Liverpool, N.Y.
GR 4-7481

Naco Electronics
74 Park Avenue
Rochester, N.Y.
Greenfield 3-4169

Naco Electronics
Stanley Theater Bldg.
261 Genesee Street
Utica, N.Y.
Redwood 2-3151

COLORADO
UTAH
WYOMING
MONTANA

McLoud & Raymond
2151 South Grape Street
Denver 22, Colorado
Skyline 6-1589

McLoud & Raymond
P.O. Box FG-146
Salt Lake City, Utah

OREGON
WASHINGTON
IDAHO

Hawthorne Electronics
700 S.E. Hawthorne Blvd.
Portland, Oregon
Belmont 4-9375

Hawthorne Electronics
Room 112 Administration Bldg
Boeing Field
Seattle, Washington
Parkway 5-1406

DOMINION
OF
CANADA

Measurement Engineering Ltd.
P.O. Box 1352
Station O
Montreal, Quebec, Canada
National 7-4313

Mel Sales Ltd.
71 Crockford Blvd.
Scarborough, Toronto

Mel Sales Ltd.
Arnprior, Ontario
Canada

OVERSEAS REPRESENTATIVES

ARGENTINA

Tecnitron
Charcas 1337
Buenos Aires

AUSTRALIA

Electronic Industries
Imports Pty Ltd.
139/143 Bouverie St.
Carlton, N. 3, Melbourne

AUSTRIA

INGLOMARK
Markowitsch & Co.
Mariahilfer Str 133
Vienna XV

BENELUX
I.R.C.A.
Paradysstraat 92
Voorburg

BRAZIL

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Caixa Postal 4612
Sao Paulo

CHILE

Fred Muller, SAC.
Casilla Coreo 3844
Santiago

CHINA

Heighton Scientific Co.,Ltd.
49, South Yen-Ping Road
Taipei, Taiwan

DENMARK

Ditz Schweitzer
Bredgade 37
Copenhagen

ENGLAND

Allied International Co., Ltd.
4, Tilney Street Park Lane
London W. 1

FINLAND

Orbis O/y
P.O. Box 2165
Helsinki — Toolo

FRANCE

Bureau de Liaison
113 Rue de L'Universite
Paris 7e

GERMANY

Rohde & Schwarz Vertriebs GMbH
Zweigniederlassung
Hohe Strasse 160-168
Koln

GREECE

Ev. D. Devletoglou
44 Eleftheriou Venizelou
Athens

ICELAND

Elding Trading Company
Hasnarhvoli
Reykjavik

INDIA

B. N. Bose & Company
Ist Floor, 8 Waterloo St.
Calcutta—1

ISRAEL

Electronic Equipment
6, Ibn Gvirol
Tel-Aviv

ITALY

Bay & C.S.P.A.
Via Fabio Filzi N. 24
Milano (506)

JAPAN

Marubun Co., Ltd.
No. 1, 2-Chome
Odenmacho, Nihonbashi
Chuo-Ku, Tokyo

MEXICO

Standard Electrica de Mexico, S.A.
Calle Madrid 21-F
Mexico 4, D. F.

NEW ZEALAND

W & K McLean, Ltd.
7 Anzac Avenue
Auckland

NORWAY

P. N. Biorn
Tollbodat. 4
Oslo

PERU

V. M. LaPierre & Cia.
Los Alamos 375
San Isidro, Lima

PHILIPPINES

Radio Electronic Headquarters, Inc
P.O. Box 1400
Manila

PORTUGAL

Equipamentos de
Laboratoria, Lda.
Apartado 458
Lisbon

SOUTH AFRICA

Leigh & Hurwitz (Pty) Ltd.
P.O. Box 3236
Johannesburg

SPAIN

Rema Leo Haag
Pla de Sto Domingo I
Madrid

SWEDEN

Electronikbolaget AB
Barangsgatan 30
Stockholm SO

SWITZERLAND

Omni Ray AG
Dufourstr 56
Zurich 8

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